vol 16 no 6 JUNE 59

American Journal of Hospital Pharmacy

official publication of the American Society of Hospital Pharmacists

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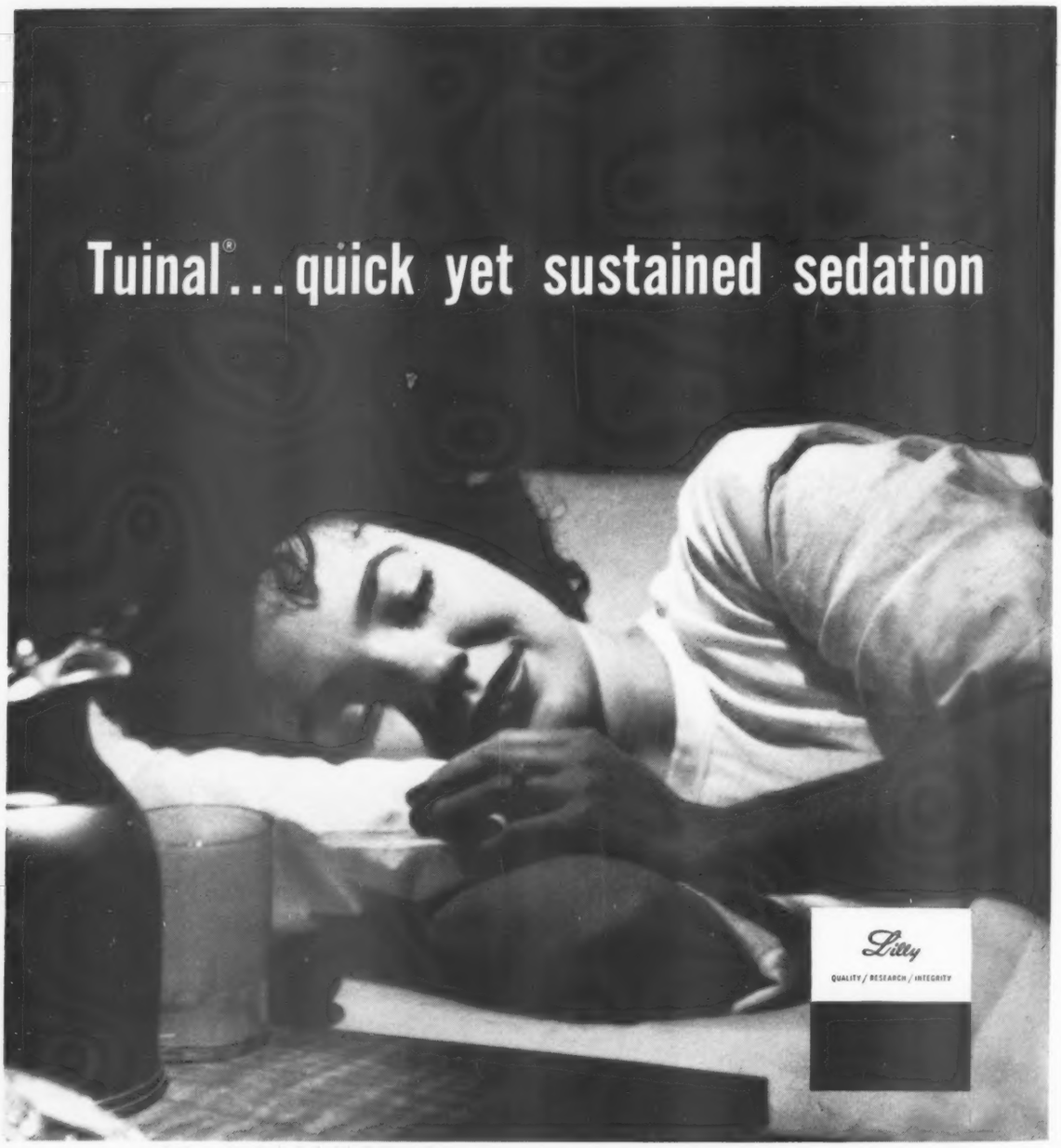
OPERATIONAL MANUALS IN HOSPITAL PHARMACY



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Dear Sirs:

Bringing Medications Into the Hospital

DEAR SIRS: We have a hospital regulation prohibiting patients bringing in medication for use in the hospital from sources other than the hospital pharmacy. Any deviation from this rule has had to be cleared by the chief pharmacist and hospital administrator.

Has there been any official action or mention of this problem by the SOCIETY? If you can furnish us with some references on this subject we would appreciate it.

PERCY RICH, JR., *Chief Pharmacist*
Riverside Community Hospital
Riverside, California

EDITOR'S NOTE: There appears to be little information available on the subject of patients bringing medication for use in the hospital. There is a reference to this problem in the "Accreditation Problems" column of *Hospitals, Journal of the American Hospital Association*, for December 16, 1957. The following is a quotation from this column:

Question: "In our hospital we find patients bringing in medications on advice of their physician and self-medicating themselves. Is this allowable? If not, how do we stop it?

Answer: "It is not allowable and should not be condoned. Hospitals usually have a ruling forbidding self-medication by patients in their medical staff bylaws, rules and regulations. These staff rules should be called to the attention of the physicians who abuse it.

"In their nursing service procedures many hospitals request the nurse admitting the patient to ask the patient if he has any medication on him and to give them up. If they are prescribed in the doctor's written order, they may be utilized. Even under these circumstances great care in proper identification must be utilized and the practice is frowned upon and forbidden in some hospitals."

I believe the central point here is that the physician must take responsibility for the identity of the medication which the patient brings in. For example, if the patient were under the physician's care outside of the hospital and had recently had a prescription calling for tetracycline filled, the physician would probably feel that the patient should be allowed to bring these capsules to the hospital and complete the use of them rather than purchasing an additional supply. However, one of the big problems of having patients bring medication into the hospital is one of the identity of the drug and unless the physician himself is willing to take the responsibility for the identity, then the drug should not be used in the hospital.

Pyrogen-Free Solutions

DEAR SIRS: In the copy I received of the American Hospital Formulary Service, I read with great interest the monograph concerning Distilled Water or Purified Water U.S.P. for Irrigating Solution. This monograph implies that irrigating solutions should not be pyrogen-free. What do we do in a case in which a physician uses a solution to wash out a bleeding area, or uses the water for transurethral resection? I would presume that there is enough absorption into the system of the water, which if not pyrogen-free, it could well cause a reaction.

It is interesting that many people are concerned over the possibility of pyrogens in solutions made in hospitals, yet it appears that they are not at all concerned over irrigating solutions which are also potential sources of reaction.

EDWARD F. CROUMEY, *Chief Pharmacist*
The Mary Fletcher Hospital
Burlington, Vermont

Appreciation

DEAR SIRS: I express my thanks for your attention to my request for copy of the Russian paper dealing with the preparation of sterile blood serum. The matter of translation presented no difficulty.

A. E. ALDRIDGE, *Manager*
I. V. S. Unit
Auckland Hospital
Auckland, New Zealand

DEAR SIRS: May I at this time express the appreciation of our entire pharmacy staff for the JOURNAL? We find it an invaluable tool.

SISTER MARY VERA, *Director of Pharmacy Service*
Mercy Hospital
Buffalo, New York

Comments From Abroad on AHFS

DEAR SIRS: Our Library has received a copy of "The American Hospital Formulary Service" and . . . I want to congratulate you and the Committee on Pharmacy and Pharmaceuticals of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS for this remarkable achievement . . .

P. BLANC, *Chief*
Pharmaceutical Section
World Health Organization
Geneva, Switzerland

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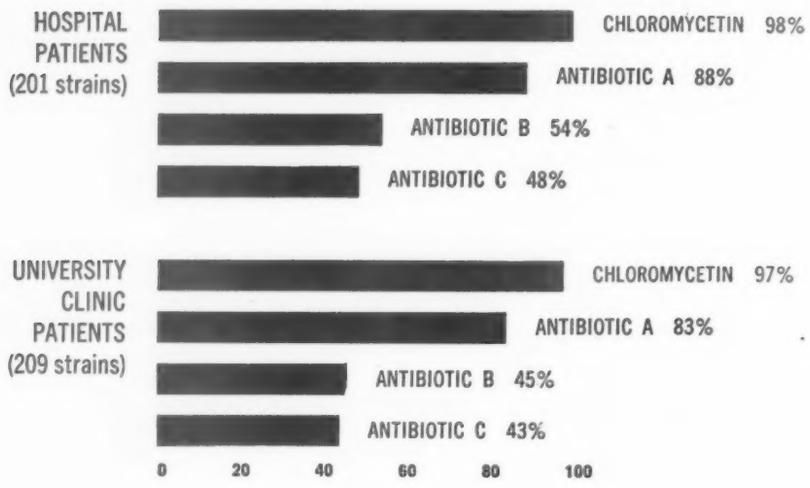

*Adapted from Fischer, H. G.: *Deutsche med. Wchnschr.* **84**:257, 1959.

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editorial

by DON E. FRANCKE

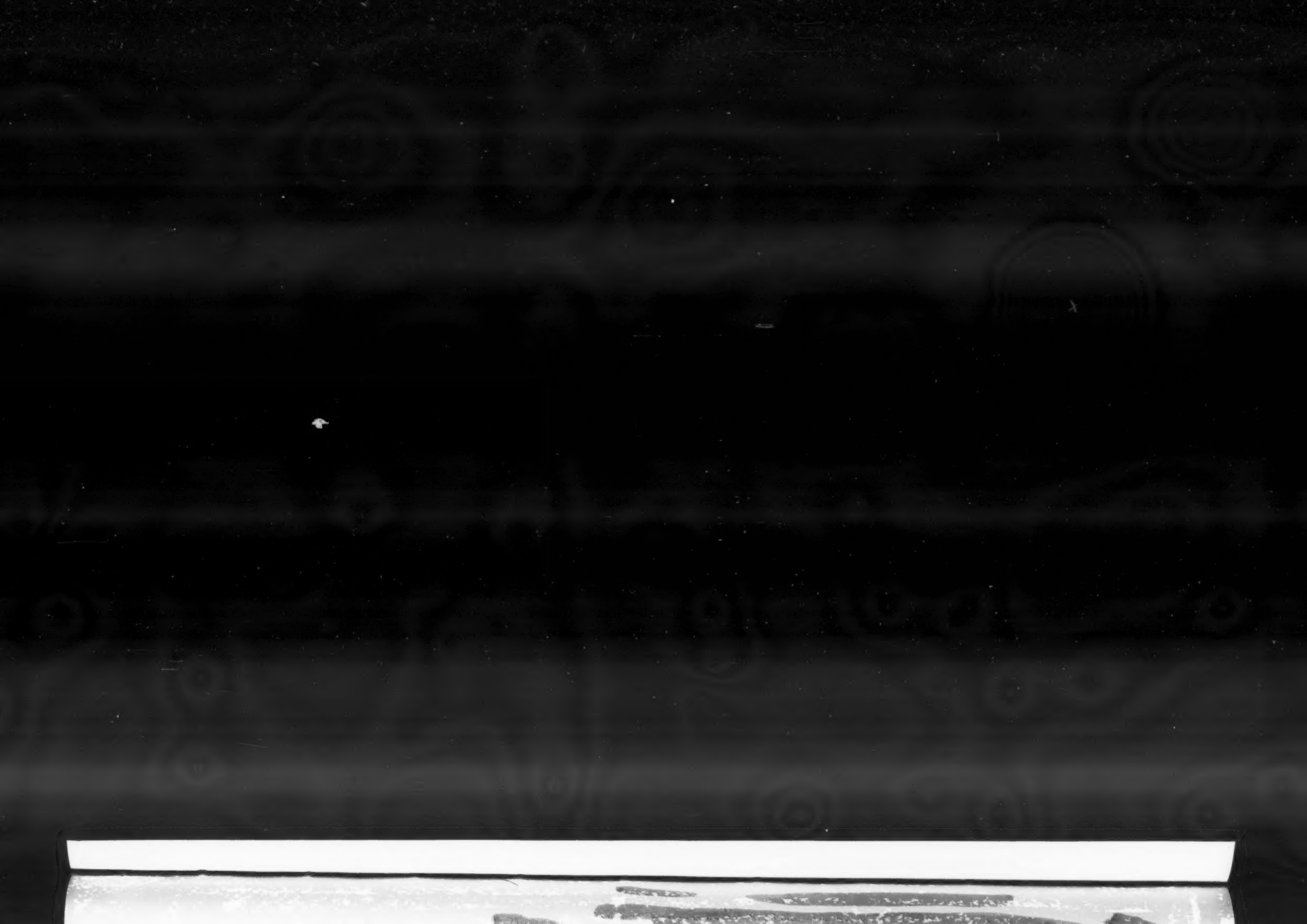
Procedural Manuals as Administrative Tools

► HOSPITAL PHARMACISTS have long been encouraged to prepare manuals of operation for their departments. However, relatively few pharmacists have undertaken and completed such a project. Possibly the principal reason for the slowness of progress is that the task of preparing a comprehensive procedural manual is a rather formidable one. Again, there are relatively few examples to serve as guides and this lack tends to act as a deterrent. Because of the importance of this subject, two articles in this issue of the JOURNAL are devoted to procedural manuals. One author discusses the general philosophy behind the procedural manual and gives suggestions and guides for its preparation. The second author presents her Pharmacy Manual in detail so that it may serve as a guide to those now undertaking a similar project and to stimulate others to begin.

Policies may be formulated and procedures adopted at three general levels in the hospital. (1) The *Board of Trustees* of the hospital establishes broad, general policies for the operation of the hospital. It considers such basic questions as professional standards, community needs, hospital financing, safety of patients, etc. (2) In the administrative or management area, the *administrator* then translates these basic policies into specific policies in terms of budget, purchase and supply, personnel, departmental coordination, etc. and may set policies within these areas. In the professional areas, the administrator, in consultation with professional staffs, such as medicine, nursing and pharmacy, helps develop policies affecting the professional care of the patient. In practice, the professional groups recommend professional policies to the administrator for his approval. (3) The *pharmacist*, or other department head, is free to set policies only within his own department. He may establish policy on such matters as assignment of personnel, manufacturing controls, supervision, legal and safety measures, dispensing and storage of drugs, etc. In addition, the pharmacist is in a position to greatly influence the formation of policies at other levels. These opportunities lie in three areas: with the Pharmacy and Therapeutics Committee where the pharmacist's voice is important when questions affecting all policies related in any way to the prescribing of drugs by the medical staff, their administration by the nursing staff, or their dispensing by the pharmacy staff are considered; with the administrative staff when policies affecting professional or administrative aspects of pharmacy are discussed, and with other departments, particularly nursing, when interdepartmental relations are involved in a matter concerned with drugs or pharmacy service.

These are at least three areas where there is a particular need for hospital pharmacists to be concerned with the development of policies and procedures. One of these involves specific, written authorization from the medical staff to dispense drugs under their nonproprietary names, even though proprietary named drugs may be in common use in the hospital. If a hospital operates under the formulary system and does not have a written policy of this type, the pharmacist, the hospital and the medical staff, are not fulfilling their responsibilities. A second area where undesirable practices exist in some hospitals is in the labeling of medications. Existence of several trade names for an identical drug makes this a complicated matter. However, procedures of labeling should be developed so that the label of the container does not imply that the content is one trade named drug when, in fact, it may be the trade named product of another manufacture or a nonproprietary named drug. A third area is that of controls for products prepared or prepackaged in the Pharmacy. Effective control procedures are important to patient safety and to the professional role of pharmacy. Each pharmacy should establish some type of control procedures. These may vary from the very simple to the more complex, but they should be established.

Procedural manuals can be a great asset in the proper management of the Pharmacy Department and the coordination of its activities with other departments and the professional and administrative staffs. Hospital pharmacists will find them valuable tools, tools however, which can never replace the professional judgement of the pharmacist.



OPERATIONAL MANUALS IN HOSPITAL PHARMACY

by SISTER MARY BERENICE, S.S.M.

► FOR QUITE SOME TIME MANY HOSPITALS HAVE BEEN discussing procedure manuals, but few have found time to produce their own. After considering the project for several years during a period when time was at a premium, and at the same time making notes of the operational functioning of our Pharmacy Department, quite a volume of data was collected. Even after accumulating the necessary material, time was needed to organize it in an acceptable form, because much of the work was done during periods of travel and time spent away from the department. In consigning to paper our actual procedures, often weak points in organization were perceptible and the need for better methods in administration was recognized. As these concepts evolved, changes which suggested improvement were made in our organization and procedures. By the time these scattered ideas were systematized the necessary changes in the department had been effected, and only actual operational procedures were recorded in the Manual, as it is now prepared.

Plan of Manual

You will note that the plan for the Manual is to include a separate section of information regarding the Cardinal Glennon Memorial and the Firmin Desloge Hospitals. Glennon Hospital's section on bulk compounding of both sterile and non-sterile preparations has been completed but will not be included until the entire description of the operations of the Glennon Hospital Pharmacy has been written. An index for the entire Manual will be included after the information regarding the three hospitals has been completed.

As stated in the section of the Manual devoted to Pharmacy Internships in Hospitals, St. Mary's, Firmin Desloge and the Cardinal Glennon Memorial Hospitals participate in a rotating internship program in hospital pharmacy. These hospitals are administered by the Sisters of St. Mary and their phamacy departments are coordinated under one Directorship.

After reading the section of the Manual outlining the operation of St. Mary's Hospital, one can determine the pattern and functioning of our Operational Manual. For all practical purposes this is all the information which another hospital can use as reference in preparing its own Manual, since no two hospitals can function in exactly the same manner nor can they have identical operational manuals. The material which we present today can serve only as a pattern for your own manual.

In the beginning our intention was to write a procedure manual, but as the first rough draft progressed we became increasingly aware that the manuscript was more than a procedure manual, and that in reality it had developed into an operational manual for the entire Pharmacy Department.

Planning the Manual

The writing of an operational manual is not difficult, and yet, it is not the work of a few days nor even of a few months. The first operational manual of any pharmacy department must contain the recorded development of the operation of the department from its very beginning, its objectives, philosophy, motivation, policies, regulations, departmental procedures, staffing pattern, job specifications, organizational plan and chart, floor plans, plot plans, description of the department, listing of physical facilities and library holdings, its intradepartmental, and interdepartmental relationships, description of its Formulary System, its Pharmacy and Therapeutics Committee

SISTER MARY BERENICE, S.S.M., is Director of Pharmacy Service, St. Mary's Hospital, St. Louis, Missouri.

Presented at the Institute on Hospital Pharmacy, Chicago, 1958.

and its activities, guidance manual for Internship and/or Residency Program in Hospital Pharmacy, when such a program is offered. At the outset one should give a short history of the institution and also state the purpose of the manual, itself.

An operational manual must of necessity be an ever progressive development and changes must be made with a definite purpose, systematically, orderly and in accord with the objectives and policies of the department.

The practical operational manual must be adaptable to circumstances since no manual can provide for every contingency. It is better to state one's policy than try to provide for every possible development, since in practice that cannot be done. Changes in policies or regulations of the entire institution will necessarily affect the pharmacy and must be reflected by changes in its policies and regulations. When writing a manual, it is essential that the pharmacist work with the administrator and receive his approval before attempting to establish it as an administrative tool of the pharmacy. The objectives, policies, regulations, etc. of the pharmacy cannot be permitted to conflict with those of the entire institution.

One point of great importance is, do not commit to writing a false picture of your pharmacy or your institution. Your operational manual should portray the actual operation of your pharmacy. Your statements should be clear and sound, but may be quite generalized, omitting many details, which during the course of time are ever changing.

Before attempting to write a manual one should read the article "The Law of Hospital Pharmacy" by Dr. George F. Archambault which appeared in *The Bulletin of the American Society of Hospital Pharmacists* Vol. 14:277 (May-June) 1957. After your manual is completed and before distribution, it is advisable to get legal advice regarding the statements made therein in order to be certain that every statement is legally sound and then one will not complicate the operation of the pharmacy nor rashly create a situation in which the institution could be involved.

Lines of Authority

The manual should show that definite lines of authority have been established and are exercised. An employee should not normally ignore a person in a lower position of authority and go directly to the person in a position of higher authority without the knowledge and approval of his immediate administrative officer. Rare circumstances may at times seem to justify such a course of conduct, but that is not the normal situation and should not be the normal procedure. Neither should a person in higher authority encourage such a situation by ignoring those in positions of lower authority and deal directly with individuals who circumvent their immediate administrative officer. Such deviations from proper lines of authority create confusion and dissatisfaction in a department or in an institution.

Operational manuals like minimum standards in their original forms are not intended as permanent tools of administration, simply because changing conditions and situations necessitate changes in operational procedures and facilities as well as in our concept of standards. Just to cite one example, we worked for months on our Operational Manual and even while we worked changes were inevitable. Even upon concluding the Manual, yet other major changes have become necessary. The completion of a 160 bed new wing to St. Mary's Hospital necessitates many construction modifications in the entire Institution. These in turn, together with the additional workload, will make additional area for the Pharmacy imperative. Fortunately there is an adjoining room which can be added to our present area, but in order to better utilize the entire area, many alterations in our present facilities are vital. As soon as this new arrangement is completed, variations in our present Manual will be required.

A manual should be written so that only the sections involved need to be re-written and inserted from time to time, without affecting the entire manual. In an ever changing world where science and knowledge and their practical application are ever developing at a maddening rate of speed, where new things take the place of the old even before they have become old from use, one must expect an ever developing manual.

Since the time needed to write an operational manual is usually extended over a period of months or longer, when one is pressed for time, it might be wise to write the manual by degrees rather than attempt to complete it all at one time. At first the manual could include departmental rules and procedures only, then as time permits, other sections can be added. In this manner, eventually the entire manual will be writtten.

Purpose

The purpose of an operational manual should be:

1. To show how the pharmacy is placed in its proper setting within the institution.
2. To show the relationship of the pharmacy with the other services and deparments of the hospital.
3. To establish written directives for the routine management of the pharmacy department and thus insure a definite uniform course of conduct.
4. To establish and to set forth in writing, as far as practical, definite policies, regulations, and job specifications for both professional

ST. MARY'S HOSPITAL MANUALS

Outline of the
Guidance Manual for Pharmacy Residencies
(Internships) in Hospitals
Administered by the Sisters of Saint Mary

Application for Admission
Introduction
Areas of Training and Instructor
Record of Orientation
Records Required of Intern

Outline of the
Procedure Manual for the Pharmacy Department
in the Hospitals Administered by the Sisters of
Saint Mary

by SISTER MARY BERENICE, S.S.M.

Preface
Objectives of the Pharmacy Department
Purpose of the Manual
Policies
- Employment of pharmacists
- Responsibilities of the Pharmacy Department
- Dispensing of Drugs
- Purchasing
- Intradepartmental Meetings
- Teaching Student Nurses
- Changes in Policies

Organizational Chart of the Pharmacy
Job Specifications
- Director of Pharmacy Service
- Associate Director of Pharmacy Service
- Director and Associate Director of the Manufacturing Department
- Chief Pharmacist
- Assistant Chief Pharmacist
- Staff Pharmacists
- Pharmacy Helper
- Secretary
- Janitor

My sincere gratitude is due to Dr. George F. Archambault, Mr. Paul Parker, Mr. Ray M. Kneifl, Mr. Grover Bowles, Mr. Tom Mohon, Sister Joseph Marie, S.S.M., Chief Pharmacist, St. Mary's Hospital, Kansas City, Missouri, and Sister Julia Marie, S.S.M., Intern in Hospital Pharmacy, St. Mary's Group of Hospital, St. Louis, Missouri, for their helpful comments and suggestions after reviewing the first rough draft of the Manual. Their suggestions and comments were invaluable and many of these were embodied in the redrafting of the entire Manual.

St. Mary's Hospital Pharmacy

Description
Regulations
- Time Schedule
- Prescriptions
- Filling prescriptions
- Stock Supplies
- Labeling of Medication
- Narcotics
- Incoming Orders
- Night Emergency Room
- Equipment Care
- Inventory
- Fire Prevention
- Accidents
- Libraries
- Personnel Directives
- Sales Interviews
- Pharmacy and Therapeutics Committee
- Hospital Formulary

Sterile Solutions Manufacture

Descriptions of Equipment
- Deionizers
- Water Stills and Operation
- Bottle Washer
- Bottle Rinser
- Pre-Mix Tank
- Filter
- Tubing
- Containers
- Sterilizer

Preparation of Containers and Closures
- Bottle
- Bushings
- Sealing Disc
- Positioning Disc
- Stainless Steel Caps

Preparation of the Solution
- Cleaning the Pre-Mix Tank
- Mixing
- Assembly

Filling and Capping
- Filling
- Capping

Sterilization
- Operation of Sterilizer

Clean Up Procedures
- Pre-Mix Tank
- Filter
- Tubing and Fittings

Inspection of Finished Products
- Inspection

Labeling and Sealing
- Labeling
- Sealing

Testing and Control Procedures
- Pyrogen Test
- Chemical
- Sterilizer Record
- Conductivity
- Production Sheets
- Release Order

and nonprofessional employees of the pharmacy.

5. To present an organized and sufficiently detailed educational program in order to prepare pharmacists for positions in hospitals.
6. To outline a program whereby the pharmacy department contributes to the education of members of the allied medical professions.
7. To institute and maintain good human relationships.

Setting forth these norms in writing will serve to prevent the error of making unnecessary changes whenever there is a change in the staff or administrative personnel. An essential principle to follow is: never lightly on the spur of the moment, make changes when one is placed in new surroundings. One first should live into a situation and learn the reasons behind the functioning of the department as one finds it, before attempting to make radical or unnecessary changes. As a rule one will be more successful when following such a course of conduct.

It might be well to define some of the terms which we have used in writing our Manual.

Statement of Objective

The objective or purpose is the heart or backbone of a thing, the reason for doing something. In writing the objective, one should state what the department aims to accomplish, its reason and motivation for doing so. An objective may consist of one paragraph or even of several pages, depending upon what one wishes to include in the objective. The objective definitely places the Pharmacy in its proper setting and determines its policy. No matter how the objective is expressed one essential thought must be included: This thought is that the Pharmacy at all times strives to give the best possible patient care. Also one's reason or motivation for doing so should be embodied in the objective. However, the scope of the objective may be much broader and include, for example, one's education program, etc. The scope of the objective is broader than the policy. It defines the policy.

Statement of Policy

The policy is a settled predetermined course of conduct so established that it expresses the objective of the department, which of necessity must conform to that of the entire institution.

In writing our policies let us be aware of the fact that there is a sensitive difference between administrative and operational policies. This aspect usually is overlooked but, nevertheless, there is a difference, even though at times it may be a little difficult to determine the distinction. *Administrative policies* deal with administrative or executive affairs of the department. *Operational policies* effect the functioning of the administrative policies.

Regulations are tools to good administration and are means or directives for implementing the policies. Regulations carry an implication of prescription by authority for the sake of controlling an organization or system, but are not ends unto themselves. They are divided into: *Rules* which may or may not imply prohibition but usually suggest a desire for order, discipline, uniformity in method, or the like. *Departmental procedures* state the manner or method of proceeding in a process or course of action.

Regulations should be firm enough so that they will not be lightly broken; nevertheless, they must be flexible to the degree necessary for the smooth functioning of the department. When this is not the case they become a hindrance rather than an aid in efficient management of a department. A pharmacist must, in practice, distinguish between civil laws and regulations and his own rules and regulations. Civil laws, regulations and moral codes must be kept in all details, but hospital created directives must be so adaptable that they tend to the better functioning of the entire institution. Regulations should be sufficiently detailed so that each employee will know what is expected of him under the various circumstances which arise, when in peculiar situations he is to use his own judgment, what policies should guide his judgment, and when he is to seek council before making decisions.

There are a number of estimates regarding the number of pharmacists required to give efficient service in a hospital. No matter which estimate we use, all of them are only conjectures. So many variables enter into the picture that none are to be considered as definite. Since no two persons can do exactly the same job in exactly the same time, to the same degree of efficiency, perhaps the great variant is the human being. There are a number of estimates quoted, for example, that it requires:

1. One pharmacist for each 100 hospital beds, and one pharmacist for each 100 prescriptions filled in an outpatient department;
2. One pharmacist for 60 prescriptions filled in an eight hour day; or that
3. One prescription may be filled per 4.8 minutes in an eight hour day;
4. Yet another opinion is based upon patient days, since bed occupancy is an essential variable.

It is also an accepted estimate that 80 percent occupancy may be considered full capacity operation. However, there are instances when the occupancy is 50 percent or even 150 percent. From the above stated facts we may deduct that bed capacity is not

a conclusive basis upon which to rely. Neither is the number of prescriptions filled a definite foundation upon which to base one's conjectures since time element per prescription is a significant mutant.

Regardless of which supposition we use, none can be accepted without qualification. Perhaps, an estimate as accurate as any other, is that it requires one pharmacist for the first average 65 prescriptions filled in an eight hour day, either for inpatients or for outpatients, and one pharmacist for each succeeding 100 prescriptions filled during the same period of time; that it requires one nonprofessional helper for each of the first two pharmacists and one for every two succeeding pharmacists. All these conjectures must be qualified. However, such estimates give an administrator some idea of what can be expected of the pharmacy personnel which he employs. It may be especially helpful for the administrator who is opening a new pharmacy department, in determining how many persons to employ.

Detailed job specifications should be outlined in the operational manual so that each employee will know the scope of his responsibilities.

Physical Facilities

The physical facilities and the description of the pharmacy department may be so variable that it would be difficult to enumerate them with reference to any degree of permanency. However, when one understands that these aspects of the department must, of necessity, be ever changing at either a rapid or a slow pace, one can list them, knowing that there may be changes even before a manual can be completed. Their recording establishes a pattern which becomes a valuable aspect of the manual.

Formulary System

A manual should contain a chapter on the Pharmacy and Therapeutics Committee and should state how the committee is chosen, its medical staff representation, its status in staff organization, pharmacy representation, its duties, limitations, and scope of activities, and policies regarding the basic drug list or hospital formulary.

If the hospital has its own formulary its scope and function should be included. It is hoped that as soon as the Formulary Service prepared by the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS is completed hospitals will use this service.

We can never lose sight of the fact that no hospital formulary is a compulsory tool which places limitations on the choice of basic drugs the physician may use in the treatment of patients. Neither the hospital, the pharmacist, nor any committee, nor any other physician has the authority to dictate to a physician what he can or cannot prescribe for his patients. If, however, the prescribing habits of a physician violate moral codes, codes of ethics to which the institution conforms and to which the physician has stated that he conforms when he joined the staff of the institution, or when his prescribing or treatment of patients constitutes poor medical practice, hospital authorities need not permit him to bring patients to their hospital. The medical staff also has certain jurisdiction over such violations by individual physicians.

Under other circumstances physicians must be permitted to prescribe any brand of a drug which he wishes to use and he must not be penalized for doing so.

Purchasing Policies

The purchasing policies of the pharmacy may be outlined and included in the manual. These are not to be entirely governed nor curtailed by the hospital formulary, *i.e.* the prescribing of physicians must not be made subservient to the rules of purchasing, but one's purchasing must be made to conform to the needs of the institution.

Pharmacy Internships

Hospitals which offer an Internship in Hospital Pharmacy should include a chapter on the hospital's internship requirements. This section should serve as an instructive operational guide for interns and for all persons concerned with teaching interns and other persons in the institution who come in contact with them. The program must conform with the requirements of the Minimum Standards for Pharmacy Internships in Hospitals adopted by the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS. It also should include any other aspect particular to the hospital and the pharmacy which in any way affects the intern and his training.

Your Manual Must Be Yours

In conclusion, before attempting to write an operational manual one may wish to review other manuals which have been written, nevertheless one should not be hedged in by what others have done. Operational manuals are comparatively new and you may originate a new concept regarding a manual just as well as those who already have written one. Regardless of what has been written, your manual must be yours. It must fit your department; it must serve your purpose. No two hospitals have exactly the same objectives, neither can they have identical policies and regulations, therefore your manual cannot serve the needs of another hospital. It must serve your needs. Other manuals can give you ideas of what a manual should contain, and also help you to commit to paper your thoughts and impressions about your pharmacy, but your manual must be yours.

MERCY HOSPITAL PHARMACY POLICIES

by SISTER MARY VERA ROURKE

► THE FOLLOWING IS AN ATTEMPT to reduce to writing the policies and procedures of the Pharmacy Department of Mercy Hospital, Buffalo, N.Y. It is offered for publication in the hope that it may, at the same time, stimulate others to do likewise and serve as a general guide to those who undertake the task. However, it must be clearly understood that these policies and procedures are those of one hospital and may not necessarily be suitable or desirable for another hospital. They are not offered or recommended for that purpose. Each pharmacist must develop his own policies and procedures with the cooperation of the administrative officials of his hospital and with the advice and assistance of the medical, nursing and other professional staffs.

Professional Policy

The following rules and regulations pertaining to the professional policy of the Pharmacy have been submitted to and approved by the Executive Committee of the medical staff and the administration of the hospital.

Pharmacy and Therapeutics Committee

There shall be a Pharmacy and Therapeutics Committee which shall meet at least twice a year. The members of the committee shall be chosen from the several divisions of the medical staff. The pharmacist in charge shall be a member of the committee and shall serve as its secretary. He shall keep a transcript of proceedings and shall forward a copy to the administrator of the hospital. The purpose of the committee shall be:

1. to develop a formulary of accepted drugs for use in the hospital;
2. to serve as an advisory group to the hospital pharmacist on matters pertaining to the choice of drugs to be stocked;
3. to evaluate clinical data concerning drugs requested for use in the hospital;
4. to add to and to delete from the list of drugs accepted for use in the hospital;
5. to prevent unnecessary duplication in the stock of the same basic drug and its preparations; and
6. to make recommendations concerning drugs to be stocked on the nursing units and other services.

Mercy Hospital Formulary

The following rules govern the admission of drugs to the formulary:

1. No nonofficial drug will be admitted, except for controlled research, before its therapeutic value has been established.
2. No preparation of secret composition will be admitted.
3. No preparation which is sold under a proprietary name will be admitted under such a name if a preparation of identical composition can be obtained under a non-proprietary name.
4. The pharmacy staff is given permission by the physician staff of the hospital to dispense the official preparation under the official title whenever a staff member prescribes by the synonymous title.
5. Requests for the inclusion of drugs or preparations not in the current edition of the formulary may be made because of evidence from the literature or from personal investigation that the preparation has sufficient therapeutic value. These requests should be made in writing to the Secretary of the Pharmacy and Therapeutics Committee who will submit them to the Committee.
6. Drugs for investigational use must be recorded with the Secretary of the Pharmacy and Therapeutics Committee by the investigator before they may be used in the hospital. In recording the drug with the Committee, the investigator is required to furnish pertinent information regarding the pharmacologic and therapeutic properties of the drug as well as the arrangements which have been made for its administration and control.
7. The administration of investigational drugs by any route by members of the Nursing Staff is prohibited until such times as adequate information concerning the actions, uses, dosage, toxicity and precautions for such drugs is available on the individual nursing units in a form approved by the Pharmacy and Therapeutics Committee.
8. The Pharmacy Department shall prepare and make available to the Nursing Department pertinent data concerning investigational drugs.

SISTER MARY VERA ROURKE is Chief Pharmacist at Mercy Hospital, Buffalo, New York.

Drug Stocks on Nursing Units

A flat rate of one dollar per day is charged to each patient for drugs. This charge is included in the daily room rate. This daily drug charge covers the use of formulary drugs.

1. The supply of commonly used drugs available in each nursing unit is determined by the Head Nurse of the unit and her Supervisor. Drugs used from the supply are replaced by the Pharmacy according to need as determined by routine checking of medicine presses by staff pharmacists. Form 28 should be used to requisition formulary drugs not routinely stocked.
2. Certain drugs due to their cost are not covered by the daily flat rate. The asterisk placed before the name of the drug in the formulary index indicates that it belongs to this class, and that such drugs should be requisitioned on Form 75. Adrenocorticotropic hormone, adrenocortical steroids, enzymes, heparin, and antibiotics belong to this class and are supplied in quantities sufficient for twenty-four hours.
3. All drugs ordered by the attending physician and not included in the formulary are requisitioned from the pharmacy on Form 75. On these requisitions the Pharmacy supplies the drug in the following quantities:

Tablets	12 or 24
Liquids	120 ml.
Sterile Solution in ampul or vial	As packaged

The container of these drugs will bear 2 labels.

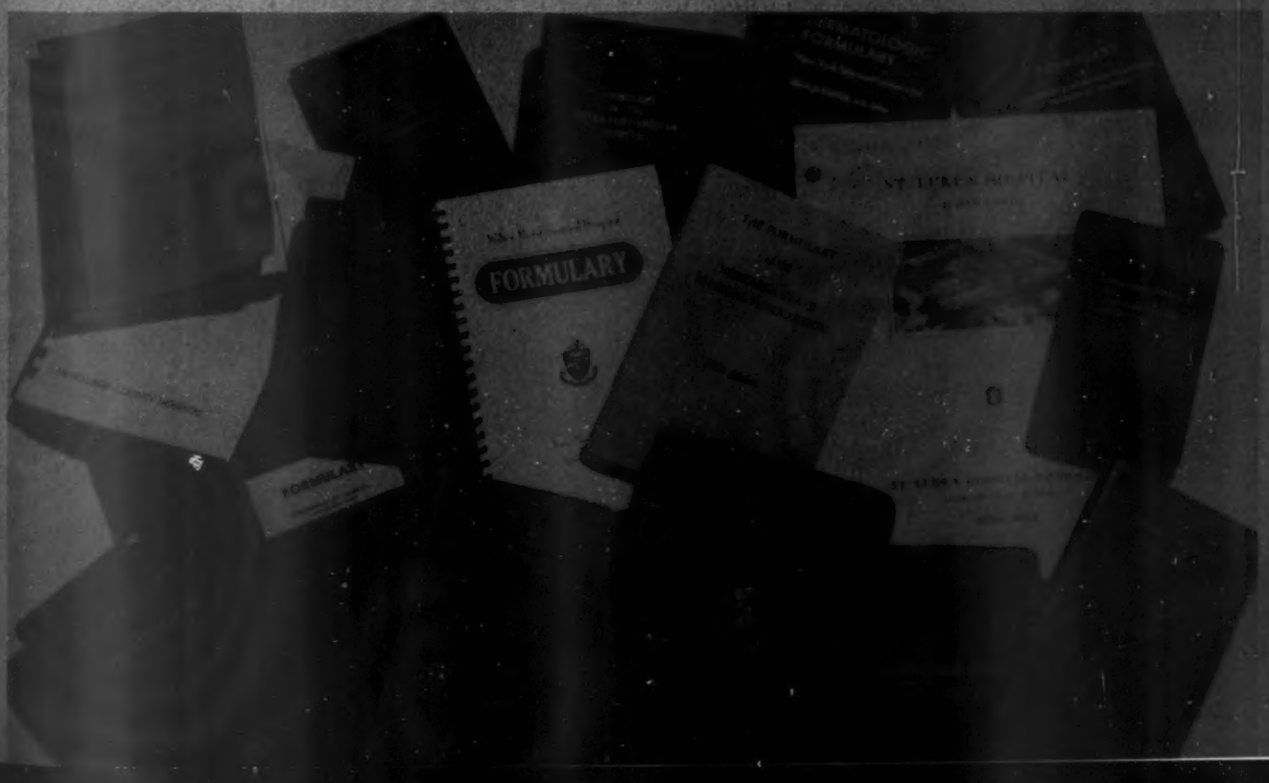
Patient's Name_____ Room No._____
has been charged for this drug. Credit will be given for unused portion returned to the Pharmacy.

4. Medications other than formulary drugs are provided when requested by attending physicians. The patient is charged for these medications. Non-formulary drugs which are rarely used are obtained locally and the entire cost is placed on the patient's bill. Credit is not extended for any portion returned to the Pharmacy. If a new drug is repeatedly requested it is stocked in the Pharmacy. It is dispensed on an individual patient charge basis (Form 75). The cost to the patient is determined by the Geiger Counter Pricing Schedule. Credit is extended to the patient's account for any portion returned to the Pharmacy with a credit slip. (Form 75, indicating that it is a return medication.)
5. Large volume intravenous fluids are ordered on Form 75A. Each Nursing Unit is provided with a stock supply of commonly used intravenous fluids. These are used as needed and replaced daily by the Pharmacy as requisitions are received in the morning drug basket.

   If a medication is added to an intravenous solution by a pharmacist, a label stating the drug and quantity added is placed on the bottle. Since the vacuum has been destroyed, a label as shown below is affixed to the bottle to remind the nurse of the short shelf-life of the solution. (12 hours is permitted.)

   Patient's Name_____ Room No._____
   If not administered before_____
   _____
   return to Pharmacy.

6. A stock supply of Penicillin Fortified and combined Penicillin Fortified and Streptomycin is kept in each nursing unit. A Record of Administration sheet is kept in each medicine press. The nurse administering either drug enters the name of the patient, his room number and the amount used. The Head Nurse totals the amount used for 24 hours and shows the actual and theoretical balance. This sheet is sent daily, except Sunday, in the morning drug basket and the quantity used is replaced.
7. Medications may not be sent home with the patient. If the attending physician wishes the continuation of the therapy, written prescriptions should be given to the patient by him so that the drugs can be obtained at a local drug store. The only exception to this policy is made:
   a. for compensation cases
   b. for indigent patients
   c. for medications available only from the hospital pharmacy.



Services to the Nursing Units

Drug baskets are collected each morning at 8:15 by a pharmacy maid. Special requisitions, for example antibiotic orders, are placed in the basket at this time. The baskets are returned to the nursing units at 10 A.M. Stock items may be ordered during the day as needed by using the yellow *Stock Requisition to Pharmacy* (Form 28). Special requisitions sent to the Pharmacy on Form 75 will be filled as soon as possible after they are received. The nurses have been requested to place the requisitions sent to the Pharmacy during the day in the special container provided. An attempt should be made by the pharmacy staff to send the drugs requested to the nursing unit at 12 noon, 2 P.M. and 5 P.M. Dispensing is to supersede manufacturing if an emergency arises and personnel is limited.

Prescriptions for inpatients are written on the Physician's Order Sheet of the patient's chart. In regard to these:

1. Stamp the prescription number on the physician's order sheet, on a label, and on a prescription blank on which the prescription is to be copied by the pharmacist.
2. Copy prescription and check.
3. Compound, label, and send to the nursing unit.
4. File prescription copy.
5. Price special requisition which accompanies order sheet when sent to the Pharmacy.

Prescriptions for outpatients are written on special blanks provided. An ordinary prescription blank is used when the patient is to have the prescription filled at an outside drug store. The regular form is used when the prescription is to be filled in the hospital pharmacy.

1. The stub is held by the patient, the remainder is sent to the Pharmacy.
2. Prescription is filled in the Pharmacy and recorded.
3. The third portion of the form is detached from the prescription proper and used as the label for the container.
4. The prescription is delivered to the clinic.

Information Service and Education

Bulletin Board

1. A current trend in drug therapy or a problem in pharmacology needing clarification is used as the subject of the display.
2. The display is changed at least once a month.

Drug Bulletins

Current drug bulletins are prepared by the pharmacy staff and sent to nursing stations as new products are prescribed by staff physicians. These bulletins consist of a brief review of the drug, giving both the generic and proprietary names, description, pharmacology, dosage, and side reactions. If there is any toxicology worthy of note it is included. These bulletins are mimeographed on loose-leaf sheets. They are sent to each nursing station; the nursing personnel is expected to insert the bulletin into the loose-leaf binder with alphabetized separators previously furnished.

Reference File

All literature and brochures received from medical service representatives are filed in the pharmacy office. This filing should be done each month after the service representatives' visits. When the piece of literature is placed in the correct folder in the file, it is numbered with the number on the folder. The name of the drug described in the literature and the number placed on the brochure are typed on a white card from the Rolodex and filed alphabetically. These references are available to staff physicians, interns, nurses and staff pharmacists but they are to be used in the pharmacy office.

Drug Displays

This program is scheduled by the Director of Pharmacy Service. Two exhibits per month are permitted. Reservations are kept on file in the pharmacy office. The following regulations have been adopted by the Pharmacy and Therapeutics Committee:

1. Displays may be held in the Doctors' Room on Ground Floor.
2. The subject matter of the display must be discussed with the Director of Pharmacy Service at least one week before the time of the Exhibit.
3. All interviews are restricted to this area.
4. Drug samples may be used by interns for evaluation of new products but they must be brought to the Pharmacy and the usual method of ordering for patients followed.

Consultative Service

Consultative service to the instructor in pharmacology in the School of Nursing is given as requested.

Administrative Policy

The following rules and regulations pertaining to the administrative policy of the Pharmacy have been submitted to and approved by the governing body of the hospital.

Organization

Director of Pharmacy Service

1. Employs and supervises pharmacy personnel.
2. Executes all administrative procedures, such as monthly and yearly reports, and policies regarding interdepartmental relationships.
3. Purchases drugs, supplies, and equipment for the Pharmacy.
4. Interviews medical service representatives of pharmaceutical companies.
5. Serves as Secretary of the Pharmacy and Therapeutics Committee; works with it on problems involved.
6. Dispenses and maintains a perpetual inventory of narcotics and alcohol.
7. Initiates recommendations regarding pharmacy development to the administration.

8. Dispenses prescriptions.
9. Attends staff meetings and semi-monthly meetings and seminars of interest.
10. Conducts semi-monthly seminars for the staff pharmacists.
11. Supervises instruction of apprentice pharmacists.

Assistant Director of Pharmacy Service

1. Checks and controls all bulk supplies and raw materials used in compounding and manufacturing.
2. Assumes responsibility for recording all formulas used and maintaining a record of all preparations manufactured.
3. Supervises all bulk compounding in the Pharmacy.
4. Assumes responsibility for equipment used in compounding and manufacturing.
5. Supervises filling of ward stock orders.
6. Inspects drugs in nursing stations as outlined in procedure manuals.
7. Supervises inspection and refilling of ophthalmic solution trays from Eye Clinic, Operating Room, Emergency Room and Central Supply.
8. Receives, checks, and records all purchase orders on arrival.
9. Assists in instruction of apprentice pharmacists.
10. Supervises sterile laboratory procedures.
11. Acts in supervisory capacity in absence of chief pharmacist.

Staff Pharmacist

1. Prepares all products manufactured.
2. Assumes responsibility for equipment used in compounding.
3. Assumes responsibility for control testing.
4. Fills ward stock.
5. Assists in inspecting drugs in Nursing Stations as outlined in the procedure manual.
6. Inspects and refills ophthalmic solution trays from eye clinic, emergency room and operating rooms and central supply.
7. Responsible for toxicology service to the emergency room.
8. Replaces stock taken from the night cupboard.
9. Edits the pharmacy news bulletin.
10. Assists in supervision of pharmacy aides and clerks.

Apprentice Pharmacists

Students are instructed in and participate where possible, in all of the services and functions performed by the pharmacy staff. They are under the supervision of the Director of Pharmacy Service.

Technician—Parenteral Solutions Laboratory

1. Compounds under supervision of pharmacist.
2. Tests solutions prepared for clarity, sterility and vacuum.
3. Maintains control records.
4. Tabulates production records.
5. Periodically checks solutions in Nursing Units for clarity, vacuum and date of preparation.
6. Maintains inventory of parenteral products.
7. Supervises laboratory helper.

Laboratory Helper—Parenteral Solutions Laboratory

1. Prepares mixing tank, bottles, etc. for procedure.
2. Prepares labels.
3. Labels finished product.
4. Assists in stock inventory.
5. Clean-up of equipment and working area.

Pharmacy Aide—Dispensing Laboratory

1. Replenish drug stock in Nursing Units as indicated by pharmacist's check list.
2. Assist in prepackaging.
3. Assumes responsibility for picking up requisitions and delivering drugs.
4. Assist pharmacist in unpacking and storing new stock.
5. Assist in labeling containers on Rejafix.
6. File cards in Kardex after prepackaging controls have been entered on them.
7. Deliver Current Drug Bulletins, News Letters, etc.
8. Assume responsibility for cleanliness of equipment and dispensing area.

Clerk

1. Files prescriptions.
2. Totals invoices monthly.
3. Files manufacturing laboratory control sheets and keeps cumulative total.
4. Prepared new cards for Kardex when indicated.
5. Enters purchase orders on Kardex and files same.
6. Enters information from invoices weekly
7. Assembles data for monthly report:
   totals charge slips;
   totals invoices;
   totals and extends floor stock requisitions;
   totals manufacturing laboratory sheets, extends cost and shows savings.

Maid

1. Cleans and processes all bottles and equipment.
2. Responsible for cleanliness of dispensing and compounding areas.
3. Replaces towels, soap in all divisions of the department.

Hours of Service

1. Week Days—8:00 A.M. to 5:30 P.M.
2. Sundays and holidays—service as needed.
3. After hour service is supplied by a pharmacist on call.
4. Night Service—A supply of drugs for emergency use has been placed in a cupboard outside the pharmacy. Second and third shift supervisors have keys to this cupboard. A requisition is left for each drug taken.

Dispensing Laboratory

The Kardex Record System supplies the pharmacist in charge with a complete knowledge of the pharmacy stock. The following is a description of the method of use which has been adapted to our pharmacy procedures. Two cards are used for each drug.

The card in the upper pocket is self-explanatory. The card in the lower pocket shows the name of the drug, form, and size. In the same line three spaces are set aside and marked *Maximum, Minimum, and Reorder.* A signal can be moved back and forth in this area and is used to indicate:

Maximum—supply is ample.
Minimum—supply is low and is to be reordered.
Reorder—the order as described on the card in the upper pocket has been placed.

Indicators or signals orange, green and blue are used.

Orange—total supply of drug is in the pharmacy.
Green—bulk supply of drug is in the pharmacy store room in the basement. A working supply is in the Pharmacy.
Blue—Drugs, usually biologicals, which bear an expiration date and which should be checked monthly for need of replacement because of outdating.

HAND LOTION

When the merchandise is received the total is added to the existing inventory and the signal is returned to maximum position. When only a portion of the order is received, the amount received is indicated on the card, the date it was received, the inventory figure is changed accordingly but the signal is allowed to remain in "reorder" position until the total order is in stock.

In prepackaging units for nursing services, the number in each bottle is shown in the left hand corner of the space marked *Unit* while the number of bottles filled is shown in the lower right hand corner of the same space. If one operator fills bottles and labels bottles, one set of initials appears in the space marked *Oper.* If two persons conduct the procedures, the initials of the one filling the bottles appear in the upper left hand corner of this space, while the initials of the one labeling them appear in the lower right hand corner. The balance remaining after the procedure is completed, is shown in the space marked *Bal.* In the space marked *Control No.* the hospital control number which is stamped on the left hand side of each label is obtained by using the month, date and last digit of the year in consecutive order, as:

January 1, 1951 appears as 01011
December 15, 1956 appears as 12156

The company control number is, of course, obtained from the label on the original package.

When a product is manufactured in the Pharmacy, the control number which appears on the work sheet is to be placed in the column *Control No. Hospital,* the date the product is manufactured shown and the resulting change in inventory. In cases where the item is manufactured in our Pharmacy Laboratory the signals are used to indicate the need of manufacturing this item, or that the item needed has been compounded.

Purchasing

The following method of purchasing has been adopted for use. Purchase Order books are obtained from the General Storeroom. These purchase order sheets are numbered. Three sheets, one white, one yellow and one pink, have the same number. The white and yellow sheets are used when the order is to be mailed. In this way a carbon copy can be retained. The yellow sheet is kept in our purchase file for 6 months. Pink sheets are used to write the orders for companies which send sales representatives monthly. The order, together with the number, is given verbally to the representative, the sheet is retained in our file.

The purchase record file is set up by company, the purchase order is filed according to company and in chronological order. The following is the purchasing procedure:

1. Purchase order is to be made out by the first of each month and is to be done by reviewing each drug listed in the Kardex and the position of the signal.
2. Sales representatives are to be interviewed the first week of each month.
3. Purchase orders are signed by the one giving the order to the representative and placed near the Kardex for entry.
4. Purchase orders are entered on Kardex and filed in Purchase Order file.
5. Invoices are checked against the Kardex.
6. Invoices for the month are totaled and a record of monthly totals is kept.
7. When the representative fails to make the scheduled call, the order is typed and sent direct.
8. Invoices are initialed by the pharmacist in charge and sent to the accounting office by the first of the month. Any discrepancy is noted on the invoice.

Manufacturing Laboratory

Formulas

Formulas in use in the manufacturing laboratory are to be found in the second section of this manual. The pharmacist in charge may include other formulas. A master copy of each formula in use must be filed in this book in its proper section. The products manufactured must meet U.S.P. or N.F. requirements. The economy of manufacturing a particular item should be determined before the procedure is undertaken. The following points should be given consideration: personnel required, assay, time, specialized equipment, frequency of use of product, storage.

Procedure

1. The Manufacturing Laboratory Sheet is to be written up for each product manufactured. The formula is obtained from the master formula, the control number of the chemicals used may be copied from the labels on the containers.
2. Any calculations are to be done on this sheet.
3. The sheet is to be signed by the one carrying on the procedure, and checked by the pharmacist in charge.
4. The control number which must appear on the labels of all preparations made in our laboratory must be shown on this sheet. The numbering machine is to be used for this, *i.e.* labels to be used on containers and the manufacturing laboratory sheet are to be numbered at the same time.
5. If an assay is indicated, the preparation is not released to the dispensing laboratory until the assay is completed.

Chemicals

Chemicals are to be purchased from reputable houses only. The responsibility of maintaining an adequate supply of raw chemicals lies with the individual using them. The need to reorder the chemicals is shown by the use of the signal in the Kardex.

It may be practical to purchase chemicals in bulk containers, too large for storage in the pharmacy proper. In this instance the chemicals are repackaged by the pharmacist who must affix to the container the control number of the chemical which appears on the original container as received from the company.

Equipment

Equipment used should be cleaned and left ready for reuse. It is the duty of the pharmacist in charge to supervise the technician and thus assure himself that chemically clean glassware, spatulas, mixers are avail-

able as needed. Glassware should be permitted to drain dry. When dry the glassware should be returned to its proper storing place. Scale pans should be protected by weighing papers and should be left clean. Weights should be removed from the scale as soon as the weighing is completed. The Torsion Balance is to be used for prescription weighing and for small quantities (not to exceed 15 Gm.), the heavy duty scale for all other weighing.

Broken glassware is not to be used. Replacements are to be requested immediately. Motors and other machinery should be checked by maintenance department as need arises. One should familiarize oneself with a piece of equipment before attempting to use it.

Mercy Hospital Pharmacy
Record of Withdrawals and Uses of Alcohol

Sheet No.————————
Date ————————————
This record
belongs to
Drum No.————————————
Withdrawn
Amount
Date
Balance
(Show calculations)
Withdrawn by
Use

Alcohol Control

Alcohol is purchased in 55 gallon drums. The Withdrawal Permit, Form 1450, is sent with each order and its return requested. When the Withdrawal Permit is returned from the vendor to us, the permit is filed in the Commercial Solvents Co. envelope in the Purchase Order File.

Alcohol is withdrawn from the vault as needed and a record is kept of the daily withdrawals. Daily dispensing or use in the Pharmacy is noted on the reverse side of this form.

The Basic Permit, Form 1447, should be fastened in the alcohol folder in the pharmacy file so that it is easily accessible. This form is obtained from the U. S. Treasury Deparment, Internal Revenue Service; three copies, properly executed, are submitted to the Treasury Department before the fifteenth of September each year. The permit is returned by the first day of January of the following year. At this time the Withdrawal Permit is returned to the Treasury Department.

RECORD OF TAX FREE ALCOHOL RECEIVED AND USED, **Form 1451**

This form is executed in duplicate by the tenth of each month. The original copy is sent to

William E. Dunigan
Assistant Regional Commissioner
Alcohol and Tobacco Tax
Bureau of Internal Revenue
143 Liberty St.
New York City (6)

The duplicate is filed in the designated folder in the Pharmacy. These reports are filed according to year and are kept for five years. The amount of alcohol used during the stated period is arrived at by adding the totals withdrawn and dividing by 3,785 ml. The amount remaining in the drum is determined by physical measurement with a yard stick and interpretation of reading by means of the table provided. If there is any discrepancy, a statement must be sent to the Treasury Department at the time the monthly report is submitted.

Narcotic Control

Narcotics

Narcotics are prepackaged and dispensed as sterile solutions or as tablets. The narcotic solutions are prepared in the Sterile Solution Laboratory. The solution is prepared and the quantity of opium derivative or other narcotic used is recorded in the perpetual inventory. A measured amount of the solution, usually 20 ml., is put into each vial. The vials are stoppered in the usual manner and autoclaved. After they are removed from the sterilizer, the vials are inspected and washed. Tablets are prepackaged in vials of twenty tablets each.

Labeling

Narcotic vials are labeled in the following manner:

1. Using the labeling machine reserved for narcotic prescriptions, a number is placed
   (a) on a label,
   (b) on the stub of the narcotic record of disbursement, and
   (c) on the main portion of the narcotic record of disbursement.
2. The labels are fastened to the vials (sterile solutions or prepackaged tablets) and the labeled supply then stored in the narcotic vault.
3. The narcotic record of administration sheets are arranged in numerical order and kept in the desk drawer.

Dispensing

When a narcotic is requested the numbered vial is given to the nurse together with the sheet bearing the same number. All information required on the narcotic record of administration sheet must be written by the pharmacist dispensing the narcotic. The nurse receiving the same, signs the sheet in the two places indicated. The stub is then torn off and kept on file in the Pharmacy.

Record File

A double filing system is used. The stubs are filed according to the nursing unit until the record of administration is returned to the Pharmacy. The stub is then removed from this file and discarded. The record of administration sheets are filed numerically according to drug used.

Dispensing Tablets Not Prepackaged

Some narcotics are dispensed in tablet form and are not prepackaged. They are counted out as requested. A regular narcotic record of administration sheet is used but no serial number appears on the sheet or on the label. The narcotics in this group are not replaced until the sheet and vial are returned to the Pharmacy. A nursing unit is not permitted to have more than one vial of the unnumbered group at one time. The record sheet and narcotic vials which are dispensed in serial numbered containers are returned when the supply is exhausted and accounted for. A second vial of the serial numbered group may be kept in reserve in the narcotic cabinet in the nursing unit.

Perpetual Inventory of Narcotics

A perpetual inventory of narcotics is kept using the Perpetual Inventory sheet. This method is used to account for receipt of orders and amounts dispensed, number of vials prepackaged and dispensed. The amount of narcotic drug used for prescriptions is entered on the Perpetual Inventory Sheet and balance shown by the pharmacist compounding the prescription. At frequent intervals the theoretical balance is compared with the actual inventory. A statement is made on the sheet by the pharmacist making the comparison,

showing that the count was taken and any discrepancy accounted for. The pharmacist initials the statement.

Lost or Stolen Narcotics

In this instance the following are notified:

1. The Hospital Administrator
2. Joseph L. Cannizzaro
   374 Delaware Ave. Wa 6131
3. Federal Narcotic Bureau
   Post Office Building Su 1473

A written report on our business letter paper must be sent to the Federal Narcotic Bureau. This must explain in detail the loss.

Narcotic Regulations

The following regulations (p. vii, Mercy Hospital Formulary) have been adopted by the Pharmacy and Therapeutics Committee so that the requirements of the Federal and state laws may be satisfied.

For doctors

1. The narcotic order must be written in ink on the physician's order sheet.
2. Each narcotic order must be signed by the physician.
3. Narcotic orders should be rewritten every 72 hours.
4. Narcotic orders given to nurses by telephone should be countersigned by the physician on his first visit to the patient for which the narcotic was thus ordered.

For nurses

1. Narcotic orders will be filled between 3:15 and 3:30 P.M. daily except Sunday. On Sunday narcotic orders should be sent to the Pharmacy in the morning drug basket. The nursing unit will be notified when the requisitions have been filled.
2. Narcotic orders to the Pharmacy should be signed by the Head Nurse.
3. Supervisors and Head Nurses will be held responsible for the proper disposition and recording of use of all narcotics under their control.
4. Narcotics lost or accidentally rendered unfit for use must be recorded and signed for by the Supervisor or Head Nurse giving full particulars.
5. Narcotic tablets or solutions unfit for use must not be destroyed but returned to the Pharmacy.
6. The Narcotic Administration Record when completed must be returned to the Pharmacy within 24 hours, whether additional narcotic supply is required or not.
7. The administration record of each dose of narcotic tablet or solution must be supplied by the nurse administering the drug at the time of administration. The record is to be written in ink.

NARCOTIC STAMPS

Class 4, 5 and the Class 3, 5 stamps are to be requested and displayed. A separate inventory of narcotics used must be maintained in accordance with the provisions of the Harrison Narcotic Act.

Sterile Solution Laboratory

FORMULAS

Formulas in use in the sterile solution laboratory are to be found in the section of the manual marked "parenteral." The pharmacist in charge may include other formulas but a master copy of each new formula must be filed in this book. The sterile solutions manufactured must meet U.S.P. and N.F. requirements.

PROCEDURE

1. Technician checks with the pharmacist:
   (a) Program for the day
   (b) Quality of the distillate
   (c) Formula
2. The Sterile Solution Laboratory sheet is to be written up for each product manufactured. The control numbers of chemicals used are to be shown on the sheet. Any calculations are to be done on this sheet.
3. Correct type of label is chosen and the control number of that batch is stamped on the labels. The control number is placed on the control sheet and the autoclave temperature record at the same time. The control number is obtained by using the month, date, last digit of the year and the number of the run. The control number of the second run on the 20th day of January 1958 appears as 012082.
4. The purity reading of the distilled water is checked before beginning operations. This is repeated before and after each procedure and the readings recorded on the control sheet.
5. The Alsop Mixing Tank is rinsed with distilled water. Approximately 10 gallons of the first distillate obtained in the morning may be used for this purpose. About 1 gallon should be allowed to run out through the lower orifice and through the assembly of the Selas filtering unit, the porcelain unit NOT being in place. The orifices are then closed and the tank filled with water. The porcelain unit is inserted and the water drained from the tank using the pump and the filter. The lower orifice must be opened to insure complete emptying of the line before starting to manufacture.
6. Both valves are then closed and the tank filled to approximately the 70,000 ml. mark with freshly distilled water. This water should be hot. The mixer should be running when the dextrose and salts are added. Mix for five minutes. Turn off. Add sufficient distilled water to bring to volume and again run the mixer for five minutes.
7. Shut off mixer. Turn on filtration pump and allow about 1000 ml. to run off to clear lines. Fill bottles which have been previously rinsed with freshly distilled water.
8. Stopper bottles with rubbers recently rinsed with freshly distilled water, place the Mylar disc which has been allowed to stand in a basin of freshly distilled water, and seal with aluminum seals.
9. Autoclave at specified temperature.
10. The tank is then rinsed with 5 to 10 gallons distilled water which is pumped out through the filtration unit.
11. The porcelain unit is removed, scrubbed and back washed with distilled water, wrapped in aluminum foil and autoclaved.
12. The tank is washed with sufficient distilled water and allowed to drain and dry spontaneously.
13. After autoclaving the bottles are allowed to cool; the following day they are washed, inspected and labeled.
14. If an assay or sterility test is indicated, the preparation is not released to the dispensing laboratory until such tests are completed and the control sheet signed by the pharmacist in charge of Sterile Solution Laboratory.

Radioisotope Laboratory

Radio-Pharmaceuticals

Radio-pharmaceuticals are ordered by a pharmacist at the request of Dr. Wm. Bukowski. He will indicate the isotope and the day on which it is to be used. Isotopes may be order Monday through Thursday before 9:45 A.M. Delivery is made the following day at approximately 1 P.M.

When placing the order the following information must be given:

Catalog Number
Form
Strength
Quantity

together with the hospital license number.

Isotopes

Isotopes are brought to the Pharmacy Department from the Receiving Room. A *pharmacist* takes the package to the Isotope Laboratory, opens the package, and places the inner container behind the lead bricks. The shipment is immediately entered in the log.

Invoices

Invoices are signed by a pharmacist and sent to the Accounting Office with the pharmacy drug bills.

Personnel Policies and Practices for Staff Pharmacists of Mercy Hospital

These personnel policies and practices apply to those registered pharmacists who are licensed by New York State Department of Education to practice in New York State. It is expected that the hospital pharmacists meet the general requirements established by the American Hospital Association, and conform to the standards approved by the Division of Hospital Pharmacy of the American Pharmaceutical Association and the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS. They are listed as follows.

1. Graduation from a College of Pharmacy accredited by the American Council on Pharmaceutical Education.
2. Current registration in New York State.
3. Completion of an approved pharmacy internship or six months' experience in a hospital pharmacy meeting the Minimum Standard for Pharmacies in Hospitals.
4. Competence in the area of pharmacy service in which the applicant will function.
5. Good mental and physical health.
6. Acceptable personnel and professional qualities.
7. Professional interest in pharmacy evidenced by membership in the American Pharmaceutical Association and in the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS.

Hours of Duty

1. The basic work day shall consist of consecutive hours.

2. A basic work week shall not exceed 40 hours.

3. Each pharmacist is entitled to 2 days off each week. It is understood that days off which fall on the weekends shall be considered on a rotating basis so that each pharmacist will have an opportunity to be off on the desirable week-end periods.

4. Realizing that the care of patients requires a 24-hour, 7 day week service, pharmacists will be expected to participate in rotation of tours of duty. A licensed pharmacist shall be available for immediate service to patients from 8 A.M. to 8 P.M. A licensed pharmacist shall be on call for the remainder of the 24 hour period. It shall be the duty of the chief pharmacist to arrange the tours of duty.

Holidays

Six holidays shall be recognized:

New Year's Day	Labor Day
Memorial Day	Thanksgiving Day
Independence Day	Christmas Day

(a) Granting of these additional days off shall mean the granting of one full day off in addition to the regular weekly days off.

(b) If the pharmacist is required to work any holiday, one day off in lieu thereof is to be granted within a two-week period before or after the holiday.

(c) If a holiday falls on the pharmacist's regular day off, he shall be granted another day off as "holiday time" within a two-week period before or after the holiday.

(d) If a holiday falls within the pharmacist's vacation time, one day shall be added to his vacation.

Overtime

Overtime to meet the emergency pharmaceutical needs of the institution of one or more hours shall be compensated by time made up to the pharmacist within the following week, or he shall be paid at the rate of three dollars per hour. A written statement of overtime must be left on the chief pharmacist's desk that same day.

Vacations

Pharmacists are encouraged to state their preference for vacation time with consideration for the good of the service and for other staff members. Vacations will be arranged far enough in advance to allow the pharmacist a choice of time and time for preparation and planning.

Vacations shall accrue as work-days at the rate of:

(a) *Four work-days* for the first six months of service. (No vacation shall be granted before the completion of six months of service.)

(b) *One work-day per month* for the second six months. (Total 10 work-days for the first year of service or a total of 10 work-days and 4 days off making a vacation period of 14 days.)

(c) During the second year of service, vacations shall accrue at the rate of 1¼ work-days per month of service. Vacation period of 15 work-days. (Total period, including days off—21 days.)

(d) During the third year of service, vacations shall accrue at the rate of 1½ work-days per month of service. Vacation period of 18 work-days. (Total period, including days of—24 days.)

(e) During the fourth year of service vacations shall accrue at the rate of 1⅔ work-days per each month service. Vacation period of 20 work-days. (total period, including off—28 days.)

(f) Vacations should not be taken in more than two separate periods.

Sick Leave

1. No sick days shall be granted prior to the first six months of service.
2. Sick leave is cumulative to ninety days.
3. Sick days shall accrue at the rate of 1 day per month.

Health Service

1. The hospital shall require and give a pre-employment physical examination to the pharmacist. This shall be given without cost.
2. This examination shall be repeated annually without charge to the pharmacist.
3. The pharmacist is to be given a written confidential report of the examination, and the hospital keeps a confidential record of the results of the examination.
4. Hospital insurance is available to all pharmacists of the staff.
   (a) Each pharmacist is expected to join the group hospital insurance plan.
5. A designated member of the staff is assigned for health examinations.
6. Pharmacists who do not submit to the annual physical examination by their own or the hospital designated physician shall not be eligible for sick leave.
7. Report of physical findings must be submitted on regular form by the examining physician.
8. All full-time employees are eligible for group plan of life insurance after three months of service.

Leave of Absence

A pharmacist shall be entitled to a leave of absence, of not more than one year, for study or other acceptable reason, after one year of satisfactory service.

Such leave shall be granted without loss of tenure status to the pharmacist.

Staff Education and Attendance at Professional Meetings

A program for staff education shall be included in on-duty time, and all pharmacists will be expected to participate in the program.

Time allowance, without deduction from pay, shall be allowed for attendance at meetings of the staff, both departmental and hospital.

It is understood that time may not be granted to all members. Therefore, such leave is granted with consideration for the other staff members and for the good of the service.

Termination of Service

Two weeks notice of intended resignation shall be given in writing to the chief pharmacist.

The pharmacist shall be given two weeks notice of dismissal with reason for dismissal, or two weeks salary in lieu of notice.

A terminal interview shall be granted.

Part-Time Pharmacists

Part-time pharmacists will be expected to meet the general qualifications as prescribed for all pharmacists employed by the institution.

Provisions for vacations, holidays, sick leaves, etc. are not applicable for the position of part-time.

Nursing Policy Regarding Illness

Students are directed to report all illness to Health Director between 7:00 A.M. and 3:30 P.M. except Saturday afternoon and Sunday. Between 3:30 P.M. and 7:30 P.M. and in the absence of the Health Director they report to Sister Mary Victorine; after 7:30 P.M. to the relief supervisor in charge of Nursing Service.

Students are not permitted to consult physicians without being referred by a representative of the Nursing School Office.

Nursing School Policies Regarding Pharmacy Requisitions

No medications are administered to students without a doctor's order.

Students are directed to secure all medication through Health Service. Self-prescribed medication is at all times discouraged and disapproved of.

All medications supplied to student nurses shall be charged by the Pharmacy on (F 75) *Requisition To Pharmacy*. This form is to be made out by the Health Director and is to be sent with the prescription, approved by Sister M. Ethel, to the Pharmacy. Mercy Hospital Outpatient Department prescription blanks are to be used as far as possible.

Pharmacy Policies Regarding Requisitions For Student Nurses

Requisitions for nurses are to be filled in turn and placed on the ledge to be picked up by the Health Director or her messenger. A two day supply is given unless a quantity is specified on the prescription.

The prescriptions are filed with "Clinical Prescriptions" unless narcotics are ordered. Narcotic prescriptions are filed accordingly.

Any single medicine charge in excess of two dollars is to be brought to the attention of the Director of Nurses. This is to be done by sending written memo to the Nursing School Office as soon as the prescription has been filled. The student's name and the charge shall appear on the memorandum. No medicine shall appear on the slip. Any further information can be obtained by the Director of Nurses by personal interview with the pharmacist.

GASEOUS STERILIZATION OF PHARMACEUTICAL AND HOSPITAL SUPPLIES

by Lewis C. Miner

► WHILE STEAM UNDER PRESSURE CONTINUES TO BE the sterilizing agent of choice, there are increasing instances where its use is precluded by the characteristics of the item to be sterilized, or by the requirements of packaging. When the materials to be sterilized cannot safely tolerate exposure to moisture and/or heat, the comparatively new technique of gaseous sterilization might well be employed. This new field of sterilization fills the ever-present need for a reliable "cold" sterilization process, whereby a variety of materials may be rendered sterile with comparative ease, rapidity and economy.[1] The methodology of handling gaseous agents is rapidly expanding and, today, equipment and procedures are being used for sterilization purposes in the pharmaceutical industry, surgical dressings and surgical appliance industries, research institutions, and hospitals.

The following review is presented as a guide to those considering the proper chemical agents and equipment for gaseous sterilization of heat sensitive pharmaceuticals and hospital supplies.

Lewis C. Miner, M.Sc., Captain, Medical Service Corps, U. S. Army, recently completed the combined graduate-internship program at the University of Michigan, Ann Arbor, Michigan.

Historical Background

The concept that vapors could be used to purify has a very early beginning in history, even though the technique of gaseous sterilization is a comparatively new process which has only recently been put on a firm scientific basis.[2] The first recorded activities in this field date back thousands of years to biblical times, even before the advent of the science of bacteriology as such. Certainly the burning of incense on alters in many religious rites, the frankincense and myrrh of biblical fame, were all associated with concepts of purification. In medieval times, during plague epidemics, records indicate that letters and messages were often held in the smoke from fires before delivery in hopes that this would in some way prevent the spread of disease. Spices were sought out not only for their flavor, but also because of a belief that their pungent odors somehow reduce food spoilage. As a result of belief in the theory that disease was caused by miasma or evil vapors, attempts were made to counteract their

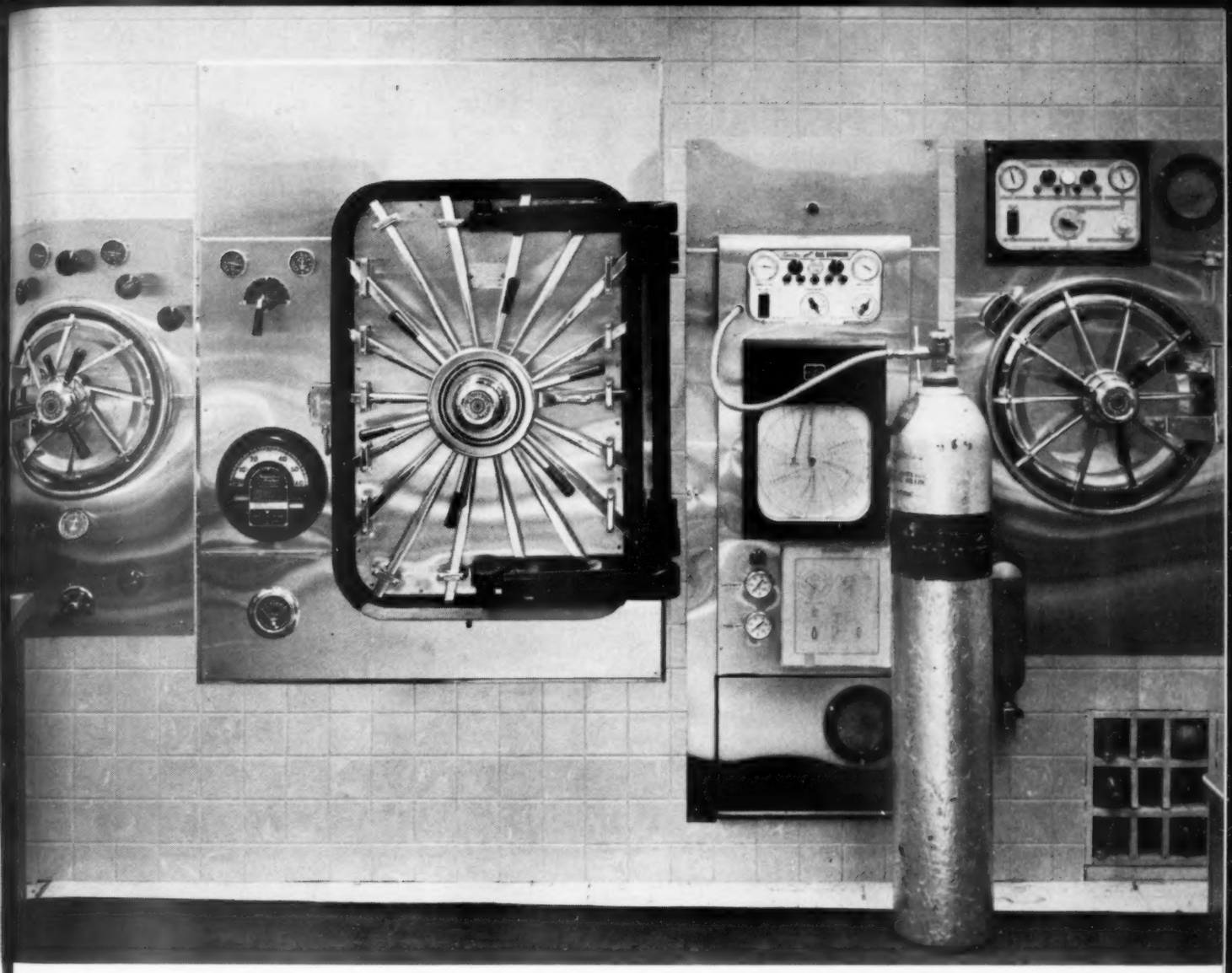


PHOTO COURTESY WILMOT CASTLE

A bank of sterilizers showing a Steroxide Gas Sterilizer incorporated into the unit

bad effects with other vapors. Probably the first instance of the application of a procedure related to gaseous disinfection occurred shortly after the promulgation of the germ theory of disease when Lister began spraying phenol into the air of operating rooms to cut down on surgical infections. Following this, the practice of terminal fumigation gained popularity and in many countries became a standard health practice. At first sulfur dioxide and chlorine were used, but due to their corrosiveness, they were eventually replaced by a much more satisfactory agent, formaldehyde. In the next two decades, hundreds of articles appeared discussing the bactericidal activity of formaldehyde vapors.[3]

The use of ethylene oxide vapor for gaseous sterilization is a considerably more recent development than is the case with formaldehyde. This compound was first described in 1863,[4] although it was not until 1928, when it was described as a powerful insecticide,[5] that it began to assume significant importance as a biological agent. From this time on its use spread rapidly. Its activity against molds was reported by Kirby *et al.*[6] Later it became widely used for sterilization of materials in a vacuum chamber process.[7,8]

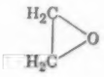
Properties of an Ideal Gaseous Sterilant

Sterilization by gaseous sterilants would indeed be convenient and relatively simple if the selected gas met all the desired requirements for use. Unfortunately, the available gases for sterilizing purposes do not meet all the ideal requirements listed below:[9]

a. Noncorrosive
b. Non-deleterious to materials
c. Penetrative
d. Residual easily removed by aeration
e. Rapid in action
f. Low toxicity to humans and animals
g. Non-flammable and non-explosive
h. Convenient to store
i. Easy to handle
j. Readily available commercially
k. Inexpensive
l. Bactericidal, sporicidal, virucidal and fungicidal at ordinary atmospheric conditions

Gaseous Agents Used

Of the various agents used as gaseous sterilants, the one that best qualifies according to the above criteria is ethylene oxide. It is an extremely reactive, colorless gas at ordinary temperatures, liquefying readily at 10.8° C. and freezing at -111.3° C.[1] It is classified chemically as a cyclic ether, or epoxy compound, the structure of which may be represented as follows:



As would be expected from compounds of this type, ethylene oxide is extremely reactive, being soluble in water and in the usual organic solvents in all proportions. It can be procured and stored in low pressure cylinders or tightly stoppered glass bottles in a dry-ice chest. Storage in an electric refrigerator should not be attempted due to the possibility of explosive vapors escaping from containers and being ignited by the motor.[10]

Flammability

Ethylene oxide is vigorously flammable and concentrations of 3 percent to 80 percent of its vapors in air form explosive mixtures. This explosion hazard has been almost completely eliminated in industry by mixing the ethylene oxide vapors with more than 7.15 times their volume of a suitable inert gas. [11, 12] This is shown in Figure 1 by the shaded area at the bottom of the chart.

The following commerical mixtures are available at the present time: 10 percent ethylene oxide and 90 percent carbon dioxide (Carboxide*); 11 percent ethylene oxide and 89 percent halogenated hydrocarbons (Cryoxcide**); 20 percent ethylene oxide and 80 percent carbon dioxide (Oxyfume 20*); and 12 percent ethylene oxide and 88 percent freon (Steroxcide 12***).

Microbicidal Action

A number of investigators, particularly those associated with the food processing industry, have demonstrated the germicidal properties of ethylene oxide.

*Union Carbide and Carbon Chemical Corp.
**Reg. Trademark, American Sterilizer Company
***Reg. Trademark, Wilmot Castle Company

Figure 1 shows the flammable range of ethylene oxide vapors and the effect of adding inert gases to eliminate the explosion hazard

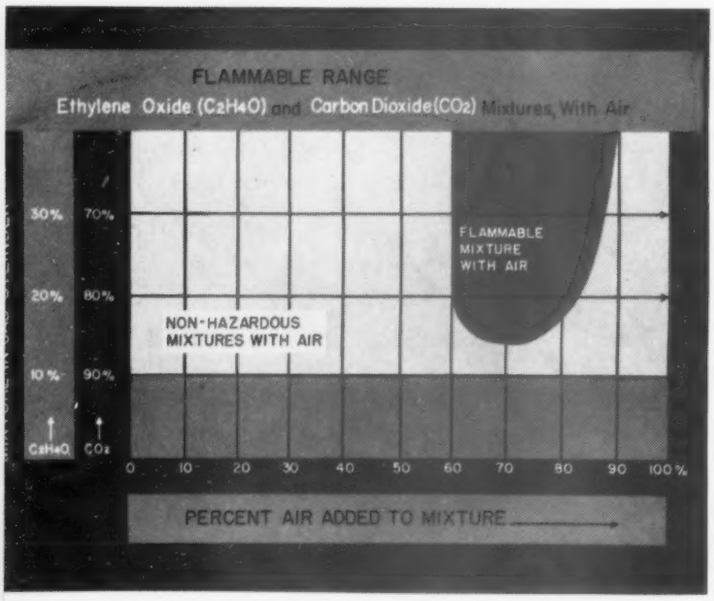
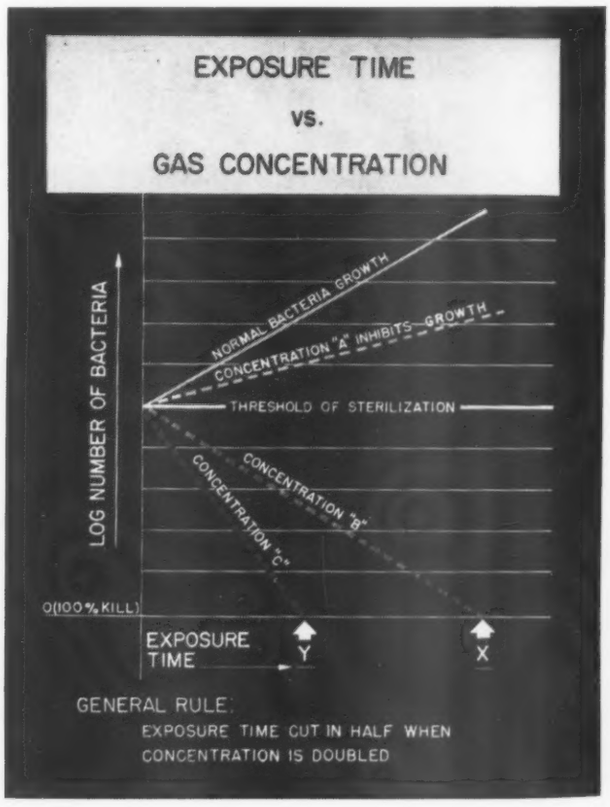


Figure 2 shows the effect of exposure time as compared to concentration of the gas in the sterilization process

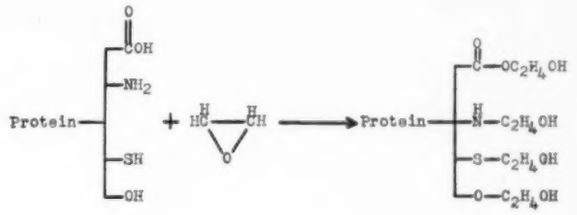


In a patent[13] filed in 1929, a mixture of ethylene oxide and carbon dioxide was described as a powerful germicide and pest exterminator. The sterilizing action of gaseous ethylene oxide, however, was not well known until the appearance in 1949 of a series of papers by Phillips and Kaye[10, 14, 15, 16] who demonstrated the sporicidal activity of the gas as well as the effects of concentration, type of organism, temperature, and moisture upon the exposure time required for sterilization. See Figures 2, 3, 4, and 5.

The virucidal ability of this agent has been clearly established in work by Ginsberg and Wilson,[17] Klarenbeek and Tongeren,[18] and Wilson and Bruno.[19] Mold spores[6] and pathogenic fungi[20] are likewise destroyed by exposure to adequate concentrations of the gas.

Mechanism of Action

The mechanism by which ethylene oxide kills microorganisms has been linked to its chemical activity as an alkylating agent.[14] According to the alkylation theory, ethylene oxide replaces labile hydrogen atoms present in carboxyl, amino, sulfhydryl and hydroxyl groups with hydroxyethyl ($-CH_2CH_2OH$) groups, thereby blocking many reactive groups needed in essential metabolic reactions.[21] (See schematic formula below.) While the preponderance of evidence today tends to support the alkylation theory, much more research information will be required before more can be done than hypothesize on the mechanism of action.



Toxicity

Ethylene oxide has a low toxicity to humans, despite its microbicidal power. It is considered to be comparatively safe for use even by unskilled personnel. An ordinary gas range presents far more risk in daily use than the operation of an automatic sterilizer employing ethylene oxide. In general, it has about the same toxicity level for humans as does the common household gas, ammonia. Small amounts may be inhaled without injury, whereas overdoses will cause only smarting of the eyes and, at the worst nausea, but no permanent effects.[22] Acute irritating effects of prolonged exposure by contact with contaminated

Figure 3 indicates the exposure time required for sterilization for various organisms

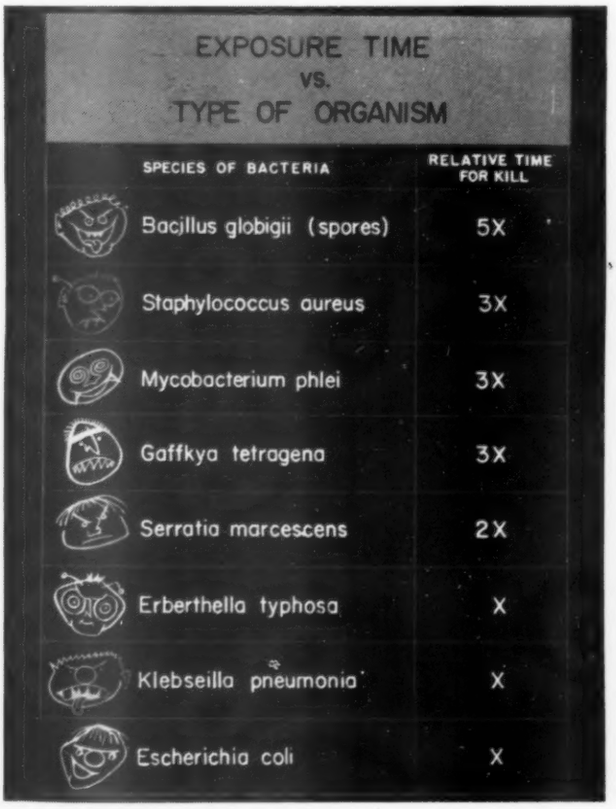
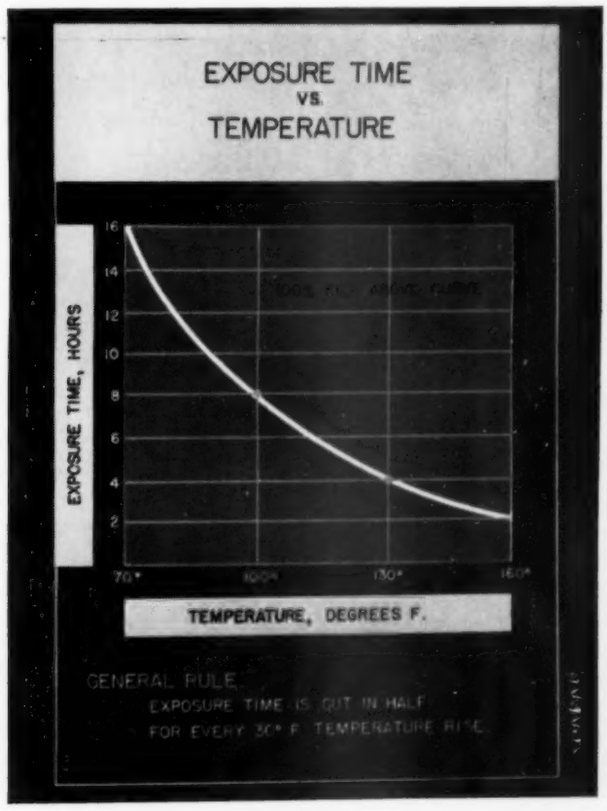


Figure 4 compares the exposure time with the temperature required for sterilization



items[23] and allergic skin manifestations to ethylene oxide have been reported.[24,25] A maximum concentration of 100 ppm is suggested for work areas.[19] Treatment for overdose is simply a matter of finding a ready supply of fresh air.

Advantages and Disadvantages of Ethylene Oxide

The advantages of ethylene oxide sterilization, using one of the commercially available gas sterilants, closely parallel the general properties desired in an ideal gaseous agent. As indicated in Figure 6 this gas will kill all known organisms at relatively low temperatures.[22] All microbial life is destroyed—not merely inhibited in growth or rendered static. Being noncorrosive, it will not discolor or chemically attack such supplies as metals, textiles and plastic. This gas penetrates all types of porous substances with remarkable ability. Phillips[14] has demonstrated the penetrating ability of this gas by showing that cotton cloth impregnated with bacterial spores and placed inside unsealed paper envelopes could be sterilized by exposure to ethylene oxide vapor at about 450 mg. per liter concentration and room temperature in from 4 to 6 hours exposure time, even though the envelopes were placed between many layers of clothing. According to Lorenz *et al.*,[26] this gas will also penetrate unbroken egg shells and sterilize the contents within.

Perhaps the major disadvantages of ethylene oxide for sterilization purposes are its slow action, often requiring many hours to achieve sterility, its potential explosive properties, and its expense compared to other more conventional methods of sterilization.

Other Gases

Other than ethylene oxide, formaldehyde is the only agent used to any appreciable extent at the present time. However, several other gases have been reported in the literature to possess bactericidal properties.

Ozone, O_3, has received some limited applications as a bactericidal agent in preventing mold growth.[2]

Methyl bromide, CH_3Br, has also been reported to possess an activity of about one-tenth that of ethylene oxide with a decided advantage of nonflammability.

Chloropicrin gas, Cl_3CNO_2, has been used with moderate success as a soil fumigant and in the fumigation of ship compartments.

Propylene oxide, CH_3-CH_2-O-CH_2, has also been mentioned as bactericidal but offers no advantage over ethylene oxide.

Epichlorohydrin, $ClCH_2$-CH-O-CH_2 and epibromohydrin,[27] $BrCH_2$-CH-O-CH_2, were found to be somewhat more active than ethylene oxide but it is doubtful if they will prove more valuable in practical sterilization.

Figure 5 shows effect of relative humidity on exposure time

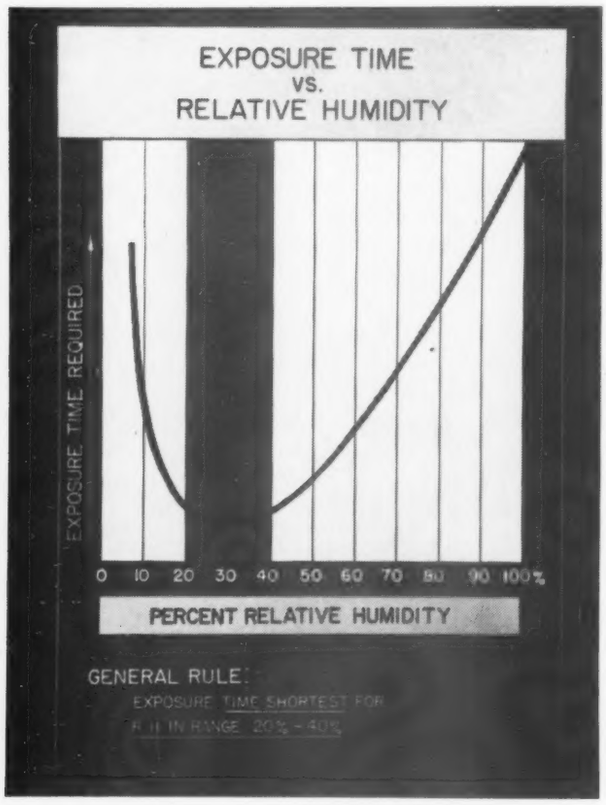
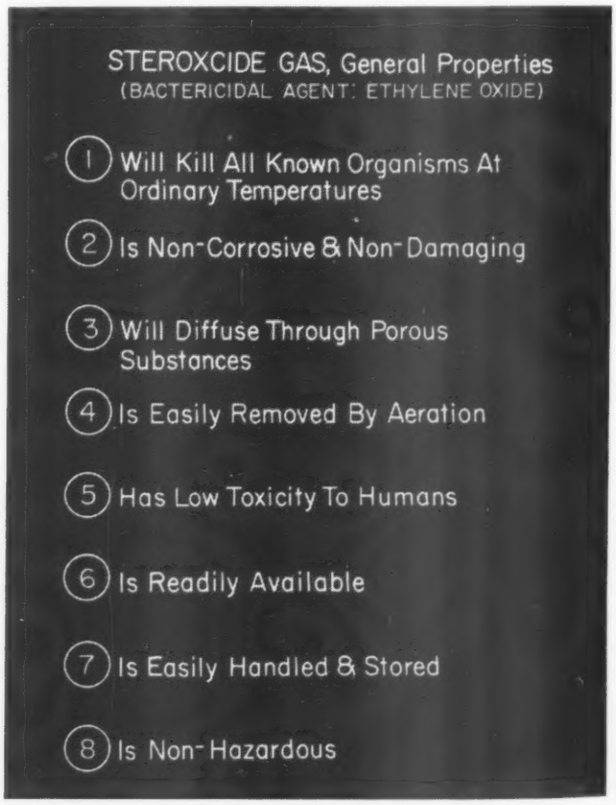


Figure 6 outlines the general properties of ethylene oxide and carbon dioxide which makes the combination an almost ideal gaseous agent for sterilization


STEROXCIDE GAS, General Properties
(BACTERICIDAL AGENT: ETHYLENE OXIDE)
1 Will Kill All Known Organisms At Ordinary Temperatures
2 Is Non-Corrosive & Non-Damaging
3 Will Diffuse Through Porous Substances
4 Is Easily Removed By Aeration
5 Has Low Toxicity To Humans
6 Is Readily Available
7 Is Easily Handled & Stored
8 Is Non-Hazardous

Ethylenimine, $H_2C\text{-}NH\text{-}CH_2$, was also reported in these same screenings[27] to be many times more active than ethylene oxide, providing certain conditions were present (*i.e.* high relative humidity). Because of these factors and in view of its highly corrosive nature, to date it has been put to little or no practical application.[2]

Applications

Advances in such varied fields as pharmaceuticals, surgical supplies and packaging have greatly broadened the range of application for which gaseous sterilization is recommended. Numerous tests have been completed by industry[9] on the efficiency of ethylene oxide as a microbicidal agent. Listed below are typical products which are unable to withstand high temperatures or excessive moisture and therefore present a most rewarding area in which to apply the techniques of gaseous sterilization.

Pharmaceutical Industry

Ampuls[28]
Biological media and other fluids[19]
Polyethylene bottles, vials and syringes[29]
Polystyrene syringes[29]
Plastic tubing and droppers
Carbohydrates[30]
Antibiotics and other suitable drugs[31]
Pancreatin[7]
Influenza and mumps antigens[32]
Rubber materials (stoppers)
Glass droppers and bulbs
Compounding equipment
Bandages, dressings, gauze, sutures

Hospital Supplies[33]

Catheters
Delicate surgical instruments
Plastic intravenous injection sets[34]
Hypodermic needles and syringes
Electrical equipment
Rubber gloves
Rubber tubing
Anesthesia masks
Telescopic instruments[35]
cystoscopes, bronchoscopes and ophthalmoscopes
Electroscopes
Spectrophotometers
Infant incubators and bassinets
Mattresses
Clothing
Blankets

Perhaps the most common application of gas sterilization in the pharmaceutical field has been for processing of penicillin, streptomycin, and various other antibiotics.

One company reported that the life expectancy of expensive technical equipment was increased, sometimes a hundredfold, through the elimination of direct steam contact.

As a possible limitation to the usefulness of gaseous sterilization in the pharmaceutical field, certain drugs and medicaments cannot be sterilized by ethylene oxide. This is due to the possibility of a chemical reaction between the material and the gas which may cause a reduction in the potency of the drug, discoloration, changes in composition, or other detrimental effects.

Pharmaceutical industry installation showing unit utilizing steam or carboxide gas, Cry-O-Therm

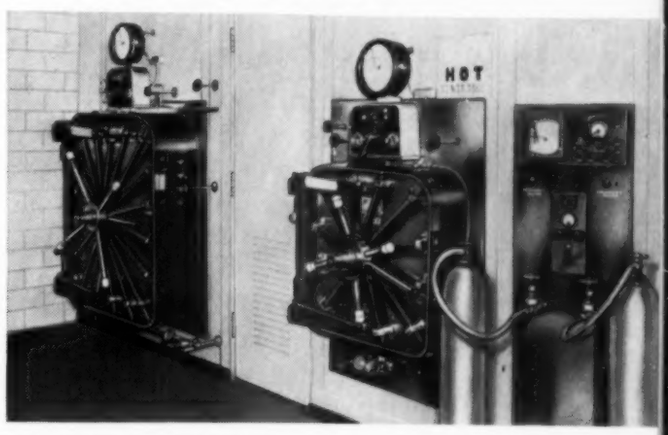


PHOTO COURTESY AMERICAN STERILIZER

Steroxcide gas sterilizer as a single compact unit

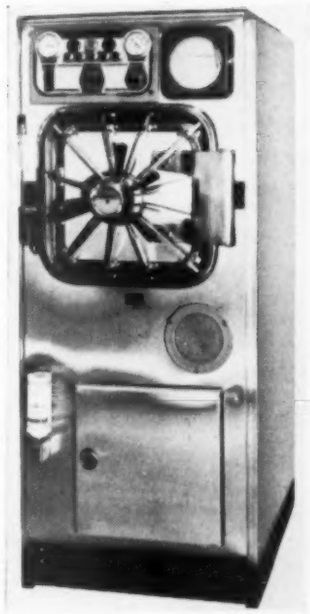


PHOTO COURTESY WILMOT-CASTLE

Equipment

Through a decade of continuing research and study, industry has developed equipment with automatic control of temperature, humidity, pressure and concentration, thereby attaining optimum conditions for gaseous sterilization with ethylene oxide. A complete range of automatically controlled equipment is available for standard or special installation at any desired

location within a hospital. The automatically controlled cycle proceeds as follows:[36]

1. A vacuum is drawn in the chamber, gas is admitted, and the correct humidity and temperature are established.

2. At the conclusion of the selected exposure period, the gas is exhausted to an atmospheric vent, and another vacuum is drawn to exhaust residual gas.

3. Bacteria-free, filtered air is then admitted to the chamber after which a signal light on the console indicates the machine is ready to be unloaded.

Summary

There are many heat and moisture sensitive articles which may now be safely sterilized by the comparatively new technique of gas sterilization with ethylene oxide. This new concept strengthens the long chain of hospital asepsis, and yet research continues its never-ending quest for even newer and better methods. Gas sterilization with ethylene oxide offers a simple inexpensive method for disinfecting a wide variety of sensitive materials, combining other desirable features such as rapid action, low toxicity to humans, ease of storage, ready availability and ease of removal by aeration, all of which further enhance its utility.

Figures 1-6 courtesy of Wilmot Castle.

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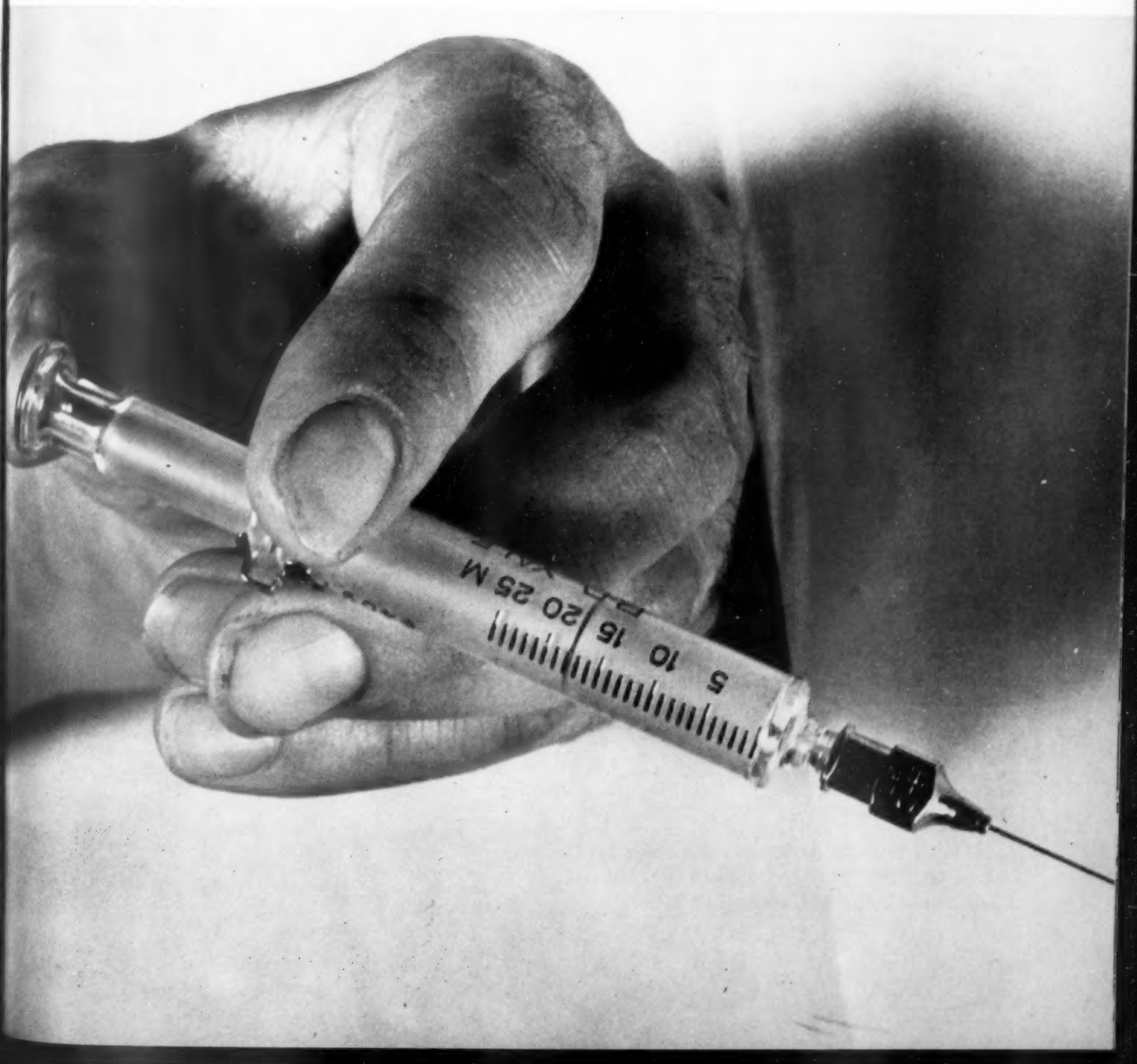
A COMPARISON OF HAND WASHING, PULSE JET WASHING AND ULTRASONIC WASHING OF SYRINGES

USING RADIOACTIVE IODINE-131 AS A TRACER



by H. M. Beal *and* D. M. Skauen

► CLEANING OF HYPODERMIC SYRINGES AND THE evaluation of cleanliness have been of continuing interest to hospital personnel. In a previous report[1] a technic was described for freeing syringes held fast with dried blood. At the same time, a method for cleaning syringes using high frequency sound irradiation was evaluated. It was further indicated that additional investigation was needed to develop a satisfactory method for evaluating cleaning efficiency.

This paper describes a method for this evaluation and the results of experiments comparing hand, automatic pulse-jet, and ultrasonic washing.

Experimental

The first experiment was designed to determine the effect of concentration of contamination (radioactivity) on the residue remaining after washing. To do this, three groups of 10 ml. syringes, 25 to a group, were labeled with a total of 492 cpm (counts per minute), 5120 cpm and 150,000 cpm of radioactive iodine-131 respectively. After 24 hours drying, all syringes were hand washed in detergent solution (Weck Cleaner), rinsed with tap water and distilled water. Each group of 25 syringes was placed in 1,000 ml. of distilled water and allowed to remain 12 hours. The syringes were then removed, the water evaporated to dryness, the dry residue dissolved in water and an aliquot counted for radioactivity with an end-window counter. The results of this experiment are reported in Table 1.

These results would seem to indicate that washing efficiency increases with increased contamination. Without doubt this is not so. This actually shows that it is possible to remove contamination down to a certain level, below which cleaning fails to remove any further residue. This would explain the evident success at high concentration.

Since the above method for obtaining a radioactive count appeared to be cumbersome, a micro-geiger tube was obtained that would fit inside the syringes. Thus, the activity before and after washing could be quickly checked by direct count. Unfortunately it was discovered after several experiments that the probe counter was only about 1/12 as sensitive as the end-window counter. In addition to this the probe counter measured radioactivity in only a small portion of the inside surface of the syringe, being unable to detect contamination in inaccessable areas of the syringe such as the Luer-Lok tip.

Procedure

The procedure that was finally adopted is the following: Groups of 10 syringes were contaminated with iodine-131 labeled blood, dried overnight, and washed by hand, jet-pulse automatic washing or ultrasonic washing. The syringes were then transferred to evaporating dishes and to each group was added 1,000 ml. of distilled water. The syringes were allowed to soak for 24 hours. At the end of this period they were removed and the water evaporated to dryness. The residue obtained was taken up in water and an aliquot subjected to counting procedures.

Equipment and Washing Procedure

Hand Washing. A nylon test tube brush was used with the number of cleaning strokes standardized.

Ultrasonic Washing. A Sonogen* AP-25-B generator with a T-52 tank was employed for all washing procedures. No attempt was made to orient the syringes in an optimum position in the tank; the syringes being placed at random in the bottom of the tank. A treatment time of 10 minutes was used on all syringes.

Automatic Washing. A standard automatic pulse-jet glassware washer** was employed for this portion

TABLE 1. EFFECT OF CONCENTRATION OF CONTAMINATION ON RESIDUE REMAINING AFTER HAND WASHING.

TOTAL AMOUNT APPLIED TO 25 SYRINGES		PERCENT OF THAT WHICH WAS APPLIED REMAINING AFTER WASHING
Group 1	492 cpm	15%
Group 2	5,120 cpm	1.2%
Group 3	150,000 cpm	0.03%

*Branson Ultrasonic Corp., Stamford, Connecticut
**Supplied by the Middlesex Hospital, Middletown, Connecticut

From the Research Laboratories, School of Pharmacy, University of Connecticut.

1. Beal, H. M. and Skauen, D. M.: Hypodermic Syringes and High-Frequency Sound, *Am. J. Hosp. Pharm. 15*:222 (Mar.) 1958.

H. M. Beal, Ph.D., is Assistant Professor and D. M. Skauen, Ph.D., is Associate Professor of Pharmacy, University of Connecticut, Storrs.

TABLE 2. A COMPARISON OF HAND-WASHING AND ULTRASONIC-WASHING OF HYPODERMIC SYRINGES

	HAND WASHING		ULTRASONIC WASHING	
Experiment Number	1	2	3	4
Initial concentration of radioactivity in counts per minute of 10 syringes	500,000	500,000	500,000	500,000
Amount remaining after washing	3,446	3,636	1,042	906
Percent of that which was applied remaining after washing	0.69%	0.74%	0.21%	0.18%

of the study. The washing cycle consisted of five minutes washing, three minutes rinsing with tap water, and a 30 second rinse with distilled water.

Table 2 shows the results of two experiments comparing hand washing with ultrasonic washing.

Table 3 records the results of experiments designed to compare automatic washing with ultrasonic washing.

Discussion

During experiments with the automatic washing equipment it was discovered that it was necessary to presoak dried contaminated syringes because the heat of the hot water used "baked" the blood onto the glass preventing its removal. In order to compare ultrasonic washing with automatic washing it was necessary to include a pre-soak stage in both instances.

In one instance 40 syringes which had been cleaned by the automatic washer were further cleaned by ultrasonic washing. A reduction of the residue was accomplished by this further cleaning.

Conclusions

1. Contamination of hypodermic syringes with blood mixed with radioactive iodine-131, cleaning the syringes and counting the residual radioactivity appears to provide a satisfactory analysis of cleaning efficiency.

2. Although no attempt was made to clean ultrasonically under optimum conditions, the syringes being merely placed at random in the sound chamber with no thought of orientation to the crystal, cleaning with ultrasonic waves compared favorably with both hand and automatic pulse-jet washing.

3. Ultrasonic cleaning possesses the advantage over hand cleaning of penetrating difficultly accessible areas of the syringe such as the metal hub, not easily cleaned by hand washing.

4. Ultrasonic washing requires less handling of the material to be cleaned than with automatic washing, since presoaking of the syringe is not required. Dried blood clinging to the surfaces is "exploded" from the glass by the action of the waves. Syringes may be placed directly in the sound chamber, treated when enough are collected for washing, and rinsed either in a sound chamber that is energized with sound waves or in ordinary rinse water. Double sink units, with both sinks energized for washing and rinsing, are available for the washing of syringes and glassware.

5. Since ultrasonic cleaning units are relatively inexpensive, require a minimum amount of space and are highly efficient cleaning units, their application in the cleaning of hypodermic syringes seems justified. Installation and maintenance problems should also be simpler for the ultrasonic cleaner which does not require the near boiling water under pressure of an automatic washer.

TABLE 3. A COMPARISON OF AUTOMATIC WASHING AND ULTRASONIC WASHING OF HYPODERMIC SYRINGES

	AUTOMATIC WASHING				ULTRASONIC WASHING			
Experiment Number	1	2	3	4	5	6	7	8
Initial concentration of radioactivity in counts per minute of 10 syringes	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Amount remaining after washing	600	120	180	180	0	76	0	120
Percent of that which was applied remaining after washing	0.75	0.15	0.22	0.22	0	0.09	0	0.15

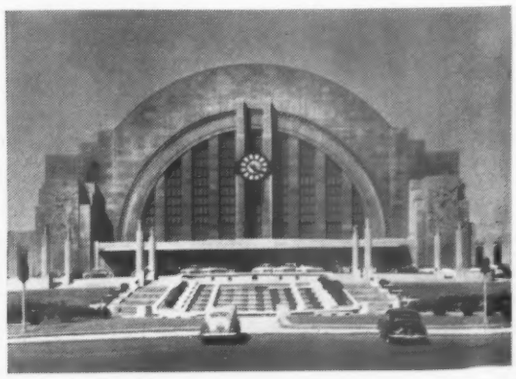
Tyler-Davidson Fountain on Fountain Square

► PHARMACISTS FROM THROUGHOUT THE NATION will convene in Cincinnati during the week of August 16 for the Annual Convention of the American Pharmaceutical Association and affiliated organizations. The AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, holding its sixteenth Annual Meeting, has scheduled sessions for Sunday, Monday, and Tuesday, August 16, 17, and 18. The ASHP meetings will be held at the Netherland-Hilton Hotel and will follow the same general pattern as during previous years. The Executive Committee will meet on Saturday, August 15, the House of Delegates on Sunday afternoon, August 16, with the General Sessions on Monday and Tuesday, August 17 and 18. In addition, special events, including a Social Hour on Sunday evening, the H. A. K. Whitney Lecture Award Dinner on Monday evening, and the traditional ASHP Breakfast on Tuesday morning, have been scheduled.

With Mr. Pat Murphy, Chief Pharmacist at Jewish Hospital, Cincinnati, serving as Chairman of the Local Committee of Hospital Pharmacists, the Society of Hospital Pharmacists of Greater Cincinnati is actively engaged in planning for special activities and assisting with the business sessions. Serving on the Committee along with Mr. Murphy are Frank Kunkel, Mercy Hospital, Mariemont, Ohio; Warren Hook, Veterans Administration Hospital, Cincinnati; and Irwin Weinberg, Cincinnati General Hospital, Cincinnati. Officers of the Cincinnati Society include Robert Erion, President; Warren Hook, Vice President, both of the Veterans Administration Hospital in Cincinnati; Phyllis Grossheim, Secretary, Jewish Hospital, Cincinnati; and Sister Mary Austin Murphy, Treasurer, Good Samaritan Hospital, Cincinnati.

In addition to assisting with the overall local arrangements, the Cincinnati group will also maintain a reception desk at Registration. The ASHP suite, which is traditionally sponsored by the SOCIETY, will be in charge of the Ohio Society of Hospital Pharmacists, with representatives of the affiliated chapters in Ohio assisting. Headed by Mr. Theodore Mink, President of the Ohio Society, other affiliates include

Union Terminal



CINCINNATI CONVENTION AUGUST 16-21

the Cleveland Society, the Toledo Society and the Cincinnati group.

House of Delegates

Opening the ASHP Meetings will be the House of Delegates on Sunday, at 2:00 P.M. Here, representatives of the SOCIETY's more than fifty Affiliated Chapters will be represented along with other delegates including members of the Executive Committee and Chairmen of Special Committees. The meeting offers an opportunity for official delegates from the Chapters to bring to the attention of the SOCIETY actions and recommendations from local groups. Also, matters which are of particular concern to the Chapters are brought before the group at this time. The House of Delegates' meeting is open to all members of the SOCIETY.

Highlighting the program this year will be a proposal for Professional Liability Insurance for Hospital Pharmacists. A Committee, appointed a few years ago to study this problem, has presented a specific proposal which will come before the Executive Committee prior to the Annual Meeting and will then be presented to the House of Delegates for consideration. President Bogash has appointed Mr. Grover C. Bowles and Dr. George F. Archambault, both Past-Presidents of the ASHP, to present the proposal and bring it before the membership at the House of Delegates' Meeting.

Taft Museum

The Art Museum

Museum of Natural History

Downtown Cincinnati

Other items of interest which will be presented at the Sunday Session include a Report on the Current Status of the American Hospital Formulary Service by Dr. William Heller, Chairman of the Committee on Pharmacy and Pharmaceuticals. Also Mr. Charles Towne, Chief of Pharmacy Service at the Veterans Administration Center in Los Angeles, will present a paper on "Advisory Committee's Consultant Service—A Chapter Project." The address of the President-Elect, Mr. Vernon O. Trygstad, will highlight the Meeting of the House of Delegates and, at that time he will present plans for the coming year, along with naming Committee appointments.

All Affiliated Chapters have received notification of the meeting of the House of Delegates, along with the official credential forms. Every Chapter is encouraged to send representatives and urge them to report back to the Chapters regarding discussions and actions taken at the Annual Meeting.

Business Sessions

Opening the First General Business Sessions on Monday morning, special activities will include formal recognition of Edward Spease (by the Ohio Society) and Harvey A. K. Whitney (by the Michigan Society). At this time, Mr. Theodore Mink, President of the Ohio Society and Mr. Edward Superstine, President of the Michigan Society will present plaques in recognition of the two deceased honorary members of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS. President Robert C. Bogash will receive the plaques in the name of the SOCIETY.

A second important event will be the establishment of the Whitney-Spease Scholarship Fund by Walter M. Frazier, a Past-President of the SOCIETY who is serving as Chairman of the Committee concerned with the Fund.

Also during the First General Session, awards will be made for contributions in the annual competition for historical writing in the field of hospital pharmacy. The awards, presented by the American Institute of History of Pharmacy, will be made by Dr. Glenn Sonnedecker, Director of the Institute. Work in connection with the competition has been coordinated by Miss Adela Schneider, Chairman of the ASHP Committee on Historical Records.

Concluding the Monday morning session will be Committee Reports, the Reports from the Division of Hospital Pharmacy and the Address of the President, Robert C. Bogash.

Preliminary Reports will be received from the Committee on Nominations which is headed by Mr. Allen V. R. Beck along with other members including Walter Frazier and Paul Parker.

Also reporting will be the Committee on Resolutions which is headed by Clifton Latiolais. Other members include, Jack Heard, Vernon O. Trygstad, and Sister Mary Rebecca. Assistants to the Committee on Resolutions are R. David Anderson, Louis P. Jeffrey and Robert Lantos.

An opportunity for bringing other business before the Annual Meeting is offered in the Second and Third General Sessions which are held on Monday afternoon and Tuesday morning. At the Fourth General Session on Tuesday afternoon, final reports are received and action taken on the Reports of the Committee on Nominations and the Committee on Resolutions.

Program

The SOCIETY'S Committee on Program and Public Relations, headed by Allen V. R. Beck, Chief Pharmacist at the Indiana University Medical Center, Indianapolis, Ind., has announced the program for the Annual Meeting. Other members of the Committee include: Leo Blackman, Mt. Sinai Hospital, New York, N. Y.; Grover C. Bowles, Baptist Memorial Hospital, Memphis, Tenn.; Roberta Dodds, Seattle Washington; Frank Dondero, U. S. Public Health Service Hospital, Seattle, Wash.; Clarence Lev, Michael Reese Hospital, Chicago, Ill.; and Claude Paoloni, Moses H. Cone Memorial Hospital, Greensboro, N. C.

According to the tentative schedule, the following papers will be presented during the General Sessions on Monday and Tuesday:

"Educational Needs for Career Hospital Pharmacists," by Donald Brodie, Professor of Pharmacy and Director of Pharmaceutical Services, University of California Medical Center, San Francisco, Calif.

"Infection Control Committee," by Samuel Hopper, Department of Public Health, Indiana University Medical Center, Indianapolis, Indiana.

"Just a Small Piece of Paper," by A. H. Holland, Cortez, Enloe, Inc., New York, N. Y.

"Effective Communications," by Burns Geiger, Pharmacy Service Manager, Pfizer Laboratories, Brooklyn, N. Y.

"Responsibility for Re-Issuing Drugs," by William A. Roose, Chief of Drug Section, and Tim Sullivan, Director of Food and Drug Division, both of the Indiana State Board of Health, Indianapolis, Ind.

"Floor Stocks, Their Selection and Control," by James D. McKinley, Jr., M. D. Anderson Hospital, Texas Medical Center, Houston, Tex.

"A Synthetic Cocoa Butter Suppository Base," by Sister M. Gonzales, Chief Pharmacist, and Gerard Wolf, Assistant Chief Pharmacist, both at Mercy Hospital, Pittsburgh, Pa.

"Experience with a Messenger Service and Drug Cart in a General Hospital," by Benjamin Kaufman,

Chief Pharmacist, Beth Israel Hospital, New York, and Isidore Greenberg, Assistant Professor of Pharmacy Administration, Brooklyn College of Pharmacy, Brooklyn, N. Y.

"Toxicological Analyses for Hospital Pharmacists," by Arthur J. McBay, Howard University Medical School, Boston, Mass.

"Pharmaceutical Displays," by Peter Solyom, Chief Pharmacist, University of Chicago Clinics, Chicago, Ill.

"Medical Staff Adoption of the Formulary System," by Walter M. Frazier, Chief Pharmacist, Springfield City Hospital, Springfield, Ohio.

"Recovery Unlimited," by Austin Smith, President, Pharmaceutical Manufacturers Association, Washington, D. C.

"Suggested Methods of Drug Charging," by Louis P. Jeffrey, Chief Pharmacist, Albany Hospital, Albany, N. Y.

"Safety Practices with Respect to Pharmacy-Nursing Procedures," Panel Discussion: *Moderator,* George F. Archambault, Pharmacist Director, U. S. Public Health Service, Washington, D. C. *Participants*: David Anderson, Chief Pharmacist, King's Daughters' Hospital, Staunton, Va.; Margaret Giffin, Director, Department of Hospital Nursing, National League for Nursing, Inc., New York, N. Y.; Robert Lantos, Director of Pharmacy Service, University of Texas Medical Center, Galveston, Tex.; and Joseph Oddis, Staff Representative, American Hospital Association, Chicago, Ill.

"Inconsistency in Pharmaceutical Names," by Charles O. Wilson, Professor of Pharmaceutical Chemistry College of Pharmacy, University of Texas, Austin, Tex.

"The Texas Medical Center, Inc., Its Development, Services, and Hospital Pharmacy," by Adela Schneider, Chief Pharmacist, Southern Pacific Hospital, and Paul D. Wilburn, Chief Pharmacist, St. Luke's Texas Children's Hospital, both in Houston, Tex.

"The Future of Hospital Pharmacy Education in Georgia," by Charles W. Hartman, Associate Professor of Pharmacy, The University of Georgia, Athens, Georgia.

"Pharmacy and Outer Space," by John Autian, Assistant Professor, College of Pharmacy, University of Michigan, Ann Arbor, Mich.

"The Women's Auxiliary in the Hospital Pharmacy," by Robert E. Lawson, Director, Pharmaceutical Services, University Hospital, University of Maryland, Baltimore, Md.

"Ophthalmic Solution Dispensing," Sister M. Florentine, Chief Pharmacist, Mount Carmel Hospital, Columbus, Ohio.

"The Human Element in Pharmacy Management," by Edward Croumey, Chief Pharmacist, Mary Fletcher Hospital, Burlington, Vt.

"Bulk Compounding Controls," by Leo Blackman, Pharmacy Director, Mount Sinai Hospital, New York, N. Y.

Due to limitations in time, a number of papers will be presented in abstract form but, if feasible, will be published in full in the AMERICAN JOURNAL OF HOSPITAL PHARMACY.

H. A. K. Whitney Award Dinner

Members of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS look forward to the H. A. K. Whitney Award Lecture Dinner which has become an annual event. This year's recipient, Mr. I. Thomas Reamer, Chief Pharmacist at Duke University Hospital, Durham, N. C., is a Past-President of the SOCIETY and also has served as Secretary of the ASHP. Mr. Reamer's outstanding contributions to hospital pharmacy and organization of the SOCIETY will be recognized.

This Award, established by the Michigan Society of Hospital Pharmacists in honor of the first Chairman of the SOCIETY, is given annually to an individual who has made outstanding contributions in the field of hospital pharmacy. The Presentation Award will be made by Mr. Edward Superstine, President of the Michigan Society and the lecture by the recipient, Mr. I. T. Reamer. Serving as Master of Ceremonies will be Mr. Grover C. Bowles.

Arrangements for the dinner are being made by the Local Committee in cooperation with representatives of the National SOCIETY and the Michigan group.

Other Special Events

So that hospital pharmacists attending the Annual Meeting will have an opportunity to meet members of the local group and leaders in hospital pharmacy from throughout the nation, the Cincinnati Society has arranged an informal "get-together," on Sunday evening, following the Meeting of the House of Delegates. This will be scheduled from 5:00 to 7:00 P. M. at the Netherland-Hilton Hotel. Following the informal Social Hour will be the official opening of the Convention of the American Pharmaceutical Association, which is scheduled for 8:00 P. M. Sunday evening.

The traditional Breakfast for Hospital Pharmacists will be held on Tuesday morning at the headquarters hotel. At this time, no official program is arranged but the President-Elect will preside.

A.Ph.A. Activities

Official announcement of the 1959 Convention is made in the April issue of the *Journal of the American Pharmaceutical Association, Practical Pharmacy Edition*. The more detailed program covering the various sections and affiliated organizations will appear in the July issue.

As mentioned above, the official opening will take place on Sunday night, August 16. Affiliated organizations, including the National Conference of State Pharmaceutical Association Secretaries, the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, and the American College of Apothecaries, will open their meetings on the weekend prior to the opening of the A.Ph.A. Convention. The A.Ph.A.'s business meetings will open with the first General Session on Tuesday night.

According to tentative plans, the Sections of the American Pharmaceutical Association, including the Scientific Section, the Practical Pharmacy Section, the Section on Historical Pharmacy, the Section on Education and Legislation, the Section of Pharmaceutical Economics, the Students' Section and the Military Pharmacy Section, will meet on two or more afternoons during the Convention week. The Scientific Section will sponsor a special meeting of interest to industrial pharmacists and this is tentatively scheduled for Tuesday afternoon, August 18.

Heading the Local Convention Committee is Nelson M. Gampfer, of the Wm. S. Merrell Company and Dean Joseph F. Kowalewski of the Cincinnati College of Pharmacy of the University of Cincinnati.

Arrangements for the A.Ph.A. Convention is under the direction of Dr. Robert P. Fischelis, Secretary and General Manager of the American Pharmaceutical Association with Mr. George B. Griffenhagen serving as Deputy Director and Coordinator of Convention activities.

All members of the American Pharmaceutical Association have received a mailing covering details of the Convention along with the hotel reservation form. As mentioned above, further details will appear in the July issue of the *Journal of the American Pharmaceutical Association, Practical Pharmacy Edition*. Hospital pharmacists will not receive a direct mailing this year since this is a duplication of information appearing in the JOURNAL and in the main Convention program.

Entertainment in Cincinnati

Special entertainment events are being arranged throughout the week by the General Convention Committee and the usual plans for entertainment for the ladies includes visiting points of local interest and the Annual Business Sessions of the Women's Auxiliary of the A.Ph.A. Cincinnati offers unusual opportunities for sight-seeing and special points of interest to pharmacists. Of particular note is the Lloyd Library which is the original collection of John Uri Lloyd, noted teacher and author of the late nineteenth century. The Lloyd Library is said to have one of the largest collections on Eclecticism in the world and one of the largest and rarest collections of pharmacopeias in America. Dr. Lloyd taught at the Eclectic Medical Institute at the Cincinnati College of Pharmacy where he became President in 1887.

Other points of interest include the Zoological Garden, the Taft Museum, the Cincinnati Art Museum, the Museum of Natural History, and the numerous city parks.

AMERICAN HOSPITAL FORMULARY SERVICE

► THE AMERICAN HOSPITAL FORMULARY SERVICE has been accepted with considerable enthusiasm and all copies of the first printing have been sold. A second printing is underway and additional copies will be available July 1, 1959. Orders may be directed to The Hamilton Press, Hamilton, Ill. The price of single copies, including supplements for one year, is $15.00.

The SOCIETY'S Committee on Pharmacy and Pharmaceuticals, working under the direction of Dr. William Heller, is preparing monographs to be included in the Supplements. It is anticipated that the First Supplement to the Formulary Service will be available within the next month.

Subscribers will want to note that extra copies of the binder are available from The Hamilton Press at $4.00 each. Some individuals using the entire set of monographs have suggested that a second binder is helpful. Also, blank pages, for use in the Formulary Service in connection with preparing monographs not available, may be ordered from The Hamilton Press. One ream (500 sheets) is available for $3.00; two reams (1,000 sheets) cost $5.40.

Since this is a continuing service, classifications have been included for which there are presently no monographs. It is anticipated that these will be made available in future supplements.

Suggestions or questions with regard to monographs or contents of the Formulary Service may be directed to Dr. William Heller, Chairman, Committee on Pharmacy and Pharmaceuticals, Pharmacy Department, University of Arkansas Medical Center, Little Rock, Arkansas.

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RAY AMBERG

► A PROFESSION reserves the right, on rare occasion, to single out a man and publicly acknowledge its respect. The measures it applies are the man's professional achievements, the values he represents and his outlook as a person. These measures must fit its image of an individual who has exemplified its own mission in society.

Mr. Ray Amberg, former practitioner of hospital pharmacy, president of the association representing American hospitals and administrator of a renowned university medical center hospital, fits this image. American hospital pharmacy and its practitioners join in honoring the man, and professional administrator.

First, as a person, Mr. Amberg represents a combination of traits and values that complement his professional abilities. His geniality, warm personality and respect for others, regardless of their station, leave a lasting impression. He is articulate and fearless in his convictions on matters of principle—but always coupled with gentleness and tact. Years of experience in hospital affairs further make his practical wisdom stand out. Passing fads and jargon in hospital matters do not cloud his basic values or principles as applied to long range thinking. The ability to interject a pinch of humor or a timely "Ambergism" at high-placed conferences often spur them to a new and proper perspective. These combinations of the man have left their contributions to his associated medical center, to the university, to his professional hospital organizations and to services for others. All represent a part of the shadow of the man who is fearlessly working in the best interests of hospitals everywhere.

As a professional, he is a pharmacist, and is now a hospital administrator, organizer, contributor, and officer of numerous professional organizations and preceptor of future administrators.

A native of Minnesota, Mr. Amberg studied pharmacy at his state university. This same university provided his first hospital-associated pharmacy position. His administrative abilities and personality earned for him promotion within hospital administration. He became Assistant Manager of the University of Minnesota Hospitals in 1924, Hospital Manager in 1929, Assistant Director in 1932 and Director of the Hospital in 1935.

His direction and participation extended to national affairs and to the people of the state of Minnesota. He served as President of the Minnesota Hospital Association, President of the Minnesota Tuberculosis and Health Association, Chariman of the Minnesota Hospital Construction Program, Minnesota State Advisory Committee on Nursing, Advisor to the Minnesota State Board of Health on Hospital Licensure, Health Committee on Registration of Hospital Administrators, and the Governor's Committee on the Handicapped.

On the national level, he is now serving as President of the American Hospital Association. He has been a Trustee of that Association and served in the House of Delegates as well as on the Councils on Professional Practice and on Government Relations.

The AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, representing the official body of practicing hospital pharmacists in the United States, is proud to pay tribute to Mr. Ray Amberg—former hospital pharmacist, hospital administrator and contemporary leader in hospital affairs.

JOHN J. ZUGICH
Past President, American Society of Hospital Pharmacists, and
Assistant Director, University Hospital Ann Arbor, Michigan

Therapeutic Trends

edited by WILLIAM JOHNSON

Endo-Cide—Superior Endodontic Agent

This new endodontic bactericide is a combination of para-aminotoluene sulfonamide and 5-nitro-2-methylfurfuryl ether. Endo-cide, as this chemotherapeutic agent is called, has been introduced for use in root canal therapy. It has proved to be a bactericide and a yeasticide. The *in vitro* effectiveness of this new agent against endodontic infections is equal to that of PBSC (penicillin, bacitracin, streptomycin, and sodium caprylate) under the conditions described by Gurney *et al* in *Oral Surg., Oral Med., and Oral Path. 12*:104 (Jan.) 1959 and *12*:222 (Feb.) 1959. On the basis of weight comparison, the new agent is superior to PBSC against endodontic infections from nonvital teeth. Upon clinical investigation of 304 cases, 90.5 percent were treated successfully within four appointments. There were no side reactions of any kind. Because of Endo-cide's wide antimicrobial spectrum, lack of toxicity and side reactions, completeness of use, relative lack of culture problems, and high clinical efficiency, this agent is regarded to be clinically superior to previously existing endodontic bactericidal agents. Endo-cide will be made available by the Novocol Chemical Manufacturing Co. Brooklyn, N. Y.

SYLVIA SCHMIDT

Catron (JB516) In Angina Pectoris

Catron (JB516), a hydrazine analogue of amphetamine, has been used in over 50 patients with mental depression, essential hypertension, terminal cancer, and coronary artery disease. This report by R. Kennamer and M. Prinzmental and appearing in *Am. J. Cardiology* 3:542 (Apr.) 1959 is concerned with the observation of this drug in 31 patients with severe angina pectoris. Marked improvement was noted in 12 of 31 patients, moderate improvement in 11, and no improvement in 8. The undesirable effects include postural hypotension, jitteriness, drug rash, and insomnia, but the incidence was low. The most satisfactory dose has been 6.25 mg. given on arising, and repeated at 3 P.M. As with iproniazid, there was a delay of several days before the beneficial effect was obtained. The mechanism of action of this monoamine oxidase inhibitor has not been established, but it is thought worthy of extensive trial. Catron was supplied by Lakeside Laboratories.

SYLVIA SCHMIDT

N, N' Diphenyl-P-Phenylenediamine in Tocopherol Deficiency Diseases

Studies with N,N'Diphenyl-P-Phenylenediamine (DPPD) showed that it had no conservational effect on vitamin E present in liver and muscles of rabbits and rats maintained on tocopherol deficient diets. The drug did bring about a rapid remission of symptoms of muscular dystrophy in rabbits fed a diet from which all lipoid material had been removed. This remission was as effective as that obtained with *alpha*-tocopheral. DPPD was also able to partially regenerate sterile female rats maintained on a vitamin E free diet. These findings indicate that the effectiveness of DPPD as a substitute for vitamin E is not due to conservation of the vitamin in tissues of the presence of residual tocopherol in the diet. The result of the tests of the drug by Draper and Csallany appeared in *Proc. Soc. Exp. Med. 99*:739 (Dec.) 1958.

RICHARD H. HARRISON

Comparison of Monoamine Oxidase Inhibitors

Comparison studies were made with iproniazid and its phenyl congener, 1 isonicotinyl-2-phenylisopropyl-hydrazine (isonicotinyl-PIH). The comparison showed that the phenyl congener is 1.5 to 2 times as effective in inhibiting MAO both *in vitro* and *in vivo*. The studies were done by Horita and Parker. The results were reported in *Proc. Soc. Exp. Biol. Med. 99*:617 (Dec.) 1958. Addition of the phenyl group to the isopropyl chain of iproniazid is the only difference between the new compound and iproniazid. This addition of the phenyl group, as shown in the tests, results in a compound with greater inhibiting properties. The tests also brought out the fact that addition of the isonicotinyl group decreases the MAO inhibiting properties of PIH. This resulting compound, isonicotinyl PIH, more closely resembles iproniazid in its MAO inhibitory action and in pharma-

cological properties than does PIH. The compound isonicotinyl-PIH was furnished for the study by Lakeside Laboratory as JB-281. Iproniazid was obtained from Roche Laboratories.

RICHARD H. HARRISON

Oxypanamine

Oxypanamine is a polycyclic alkaloid of undetermined structure obtained as an air oxidation product of panamine, the latter being a new alkaloid isolated from the seeds of *Ormosia panamensis*. In dogs, it produces prolonged reduction of systemic blood pressure, elevated pulmonary artery pressure, bronchoconstriction, increased hematocrit, cutaneous erythema and urticaria, effects which ensue following a latent period of 30 to 120 seconds after intravenous injection. Intra-arterial injections of oxypanamine produced no direct increase in femoral artery blood flow in doses less than those which lower blood pressure when given intravenously. Large intra-arterial doses produce a prolonged, delayed increase in flow simultaneously with a fall in systemic arterial pressure. Oxypanamine produces neuromuscular blockade in dogs and chickens similar to that caused by *d*-tubocurarine. It also produces other actions in dogs such as piloerection, mild sedation, ataxia, and potentiation of barbiturate anesthesia. Moran *et al.* reported the above in *J. Pharm. Exper. Therap.* *125*:73 (Jan.) 1959.

WILLARD E. HERSHBERGER

Demethylchlortetracycline—A New Antibiotic

A new antibiotic was tested in comparison studies with the tetracyclines. The tests were done by Sweeney *et al.* and the results were reported in *Antibiot. Chemotherap.* *9*:13 (Jan.) 1959. Demethylchlortetracycline was produced from a mutant strain of *Streptomyces aureofaciens*. *In vivo* tests showed the new drug to be effective against staphylococcus, streptococcus, klebsiella and pneumococcus infections in mice. The drug is well absorbed from the gastrointestinal tract and, while it may not produce higher blood levels than the other tetracyclines, it does produce prolonged serum antibiotics concentration. Tests showed that demethylchlortetracycline activity was still present at 72 and 96 hours after administration. The drug was well tolerated in doses of 250 mg. orally in man, with a low order of toxicity. The results of the tests suggest that demethylchlortetracycline merits trial in the treatment of sensitive microbial infections of man.

RICHARD H. HARRISON

Ferrous Fumarate

Ferrous fumarate is a new iron complex, the iron content being 33 percent as compared with 20 percent in ferrous sulfate, 31 percent in desiccated ferrous sulfate, and 12 percent in ferrous gluconate. Twenty-one iron deficient patients were treated with ferrous fumarate at various dosage levels as reported by Shapleigh and Montgomery in *Am. Pract. Dig. Treat.* *10*:461 (Mar.) 1959. The usual dose was one 200 mg. tablet four times daily (with meals and at bedtime). In the patients having uncomplicated iron deficiency, the therapeutic response to ferrous fumarate was excellent. Of the 21 patients treated, 18 experienced no gastrointestinal or other undesirable side effects. Two patients had mild gastrointestinal symptoms which did not require discontinuing the drug, and one was intolerant to all oral iron preparations tried. This investigation indicates that ferrous fumarate, providing much more elemental iron, is less irritating to the gastrointestinal tract than are the older preparations. Ferrous fumarate was supplied as Toleron by the Mallinckrodt Chemical Works, St. Louis, Missouri.

SYLVIA SCHMIDT

U-6538—Riboflavin Analogue

Montague Lane *et al* report in *J. Nat. Cancer Inst.* 22:349 (Feb.) 1959, the synthesis of a riboflavin analogue, sodium-6,7-dimethyl-9-(2'-hemisuccinoxyethyl)-isoalloxazine (U-6538). Administered parenterally, this compound produced inhibition of rat tumor growth which could be reversed by riboflavin. The drug was capable of inhibiting the growth of a rat lymphosarcoma. Prolonged parenteral administration of U-6538 was well tolerated by rats and dogs. A trial of U-6538 was conducted in four patients with malignant neoplasms and drug dosage was limited by precipitation of a metabolite in the urinary tract. Some patients had signs of renal injury. No definite evidence was obtained of clinical riboflavin deficiency or antitumor effects. The explanation for this is based on the metabolism of the drug. The U-6538 for this study was supplied by the Upjohn Company Research Laboratory.

WILLARD E. HERSHBERGER

Griseofulvin

Mycoses caused by various species of dermatophytes showed a uniformly favorable response to oral therapy with griseofulvin, and antibiotic isolated from *Penicillium griseofulvin*. Tinea corporis, tinea pedis, and tinea capitis improved in 1-3 weeks. Onychomycosis required 3-4 months to clear, but new normal nail growth was seen earlier. Infections caused by *Candida albicans, Malassezia furfur,* and *Blastomycosis dermatitidis* did not seem to respond to this therapy. Although toxic reactions appeared to be minimal in therapeutic doses in man, the animal data indicated that repeated peripheral blood cell counts should be performed during a

course of prolonged therapy. Harvey Blank *et al* in *A.M.A. Arch. Dermatol.* 79:259 (Mar.) 1959 relate further that one patient developed an urticaria-like drug eruption after six weeks of continuous therapy, and others had mild self-limited complaints of gastrointestinal distress and headache. A daily dose of 1.0 Gm. seemed to be adequate, although the minimum effective dose and the optimum dose have not been established for all types of infection. The duration of treatment required probably will vary, apparently depending on the time required for normal replacement of the infected tissues. Likelihood of relapse or recurrence of infection is as yet not known. Griseofulvin was supplied by Glaxo Laboratories England and Johnson and Johnson.

SYLVIA SCHMIDT

Thiostrepton Troches

Thiostrepton is a new, extremely active antibiotic with a penicillin type spectrum of activity. Because of the marked insolubility of this compound and its lack of absorption through the gut, no parenteral or systemic oral dosage form is anticipated. Thus, thiostrepton has been suggested to be of value in the treatment or prevention of superficial infections following topical application to various accessible sites, such as the mouth. Salivary specimens were assayed before, during, and after administration of 10 mg. thiostrepton troches to 12 adult male volunteer subjects. The findings as reported by Charles Berman *et al* in *Oral Surg. Oral Med. Oral Path.* 12:315 (Mar.) 1959 were based in terms of minimum inhibitory concentrations of thiostrepton against various susceptible microorganisms. In 9 of 12 subjects saliva levels far in excess of this minimum inhibitory level were obtained during the periods in which the troche was not yet completely dissolved and some 35 minutes after the troche had been dissolved. Thiostrepton was supplied by the Squibb Institute for Medical Research.

SYLVIA SCHMIDT

L-Triiodothyronine for I.V. Use

Reporting in *Am. J. Med. Sci.* by Nodine *et al.,* 237:27 (Jan.) 1959, a total of 61 patients were entered into a study of tuberculosis therapy. A random selection, with pairing of cases, was treated either with triiodothyronine or with a placebo, in addition to standard antituberculous therapy. An average dose of triiodothyronine of 202.6 mg. per day was achieved, and continued for an average period of 5.3 months. This dose was sufficient to make the patients, in general, mildly thyrotoxic, as evidenced by continued tachycardia, failure to gain weight, failure to show increased serum cholesterol, and suppression of thyroidal I-131 uptake, in contrast to placebo-treated controls. No significant difference was observed in sputum conversion and resolution of infiltration in the patients treated with triiodothyronine, compared to the controls. The Research and Development Division of Smith, Kline and French Laboratories, aided in this study.

WILLARD E. HERSHBERGER

New Technique With Hydroxydione

A new form of hydroxydione, Presuren, was tested by Galley and Lerman. The results of their studies were reported in the *Brit. Med. J.* 1:332 (Feb. 7) 1959. The new product is in the form of a fine powder, readily soluble in water with little shaking. Other older types left soapy deposits clinging to the sides of the vial, which required much shaking and formed a frothy solution. Pain may occur in a few patients when a 10 percent solution is injected intravenously. This may be overcome, however by using 0.25 percent procaine or 0.5 percent lignocaine as the solvent. Reasonable doses cause much less respiratory depression than comparable clinical doses of thiopentone. The new drug also rapidly depresses the laryngeal and bronchial reflexes, making it the anesthetic of choice for bronchoscopies and laryngoscopies. Presuren was also recommended for cesarian section, thyroidectomy and patients exhibiting partial respiratory obstruction. Presuren minimizes the usual post-operative fatigue. It also produces a sense of well-being during the recovery period which enables the patient to disregard most of the discomforts following an operation.

RICHARD H. HARRISON

Intranasal Hydrocortisone Acetate Powder

Forty-five patients, 35 adults and 10 children, were treated with intranasal insufflation of hydrocortisone acetate powder during the 1957 grass and ragweed seasons. The series consisted of 15 new patients, and 30 old patients who had had hyposensitization treatment before the season but had hay fever symptoms. The dosage of 5 to 15 mg. of hydrocortisone powder daily was found to be sufficient. No clinical symptoms of hypercortisonism were noted and the medication was well tolerated locally. Intranasal insufflation of powdered hydrocortisone acetate gave relief to a large number of patients with symptoms of hay fever who were not controlled by other methods of treatment. This simple and safe therapy can be used in conjunction with hyposensitization of pollen extracts for the control of nasal and ocular symptoms with results far superior to other methods currently in use. Powdered hydrocortisone acetate capsules (Aerocaps) and insufflators were supplied by the Armour Laboratories. This study by Lynch *et al* was reported in *Am. Practitioner and Dig. Treatment* 10:469 (Mar.) 1959.

WILLARD E. HERSHBERGER

Timely Drugs

Anturan

CHEMICAL NAME: Sulfinpyrazone.
INDICATIONS: Long-range management of chronic gout; 4 to 6 times as potent as other uricosuric agents.
DOSAGE: As directed by physician.
PREPARATIONS: Tablets of 100 mg., scored.
PACKAGING: Bottles of 100 tablets.
SUPPLIER: Geigy Pharmaceuticals.

Chloromycetin Succinate

CHEMICAL NAME: Chloramphenicol sodium succinate.
INDICATIONS: Parenteral antibiotic therapy with broad antimicrobial spectrum.
SIDE EFFECTS AND CONTRAINDICATIONS: As with other antibiotics, use may result in overgrowth of non-susceptible organisms, particularly Monilia.
DOSAGE: May be administered intravenously, intramuscularly, or subcutaneously. Intravenous: as a 10% solution to be injected over a one-minute period; intramuscular: as a 25 to 40% solution injected deep into the muscle at one of the common sites of intramuscular injection; subcutaneous: as a 10% solution injected into the subcutaneous tissue through a short, small-gauge needle; chloramphenicol succinate is prepared for injection by the addition of an aqueous diluent such as Water for Injection or 5% Dextrose Injection; sterile solution may be kept at room temperature for 30 days without loss of potency.
PREPARATIONS: Vials containing 1 Gm. chloramphenicol sodium succinate.
PACKAGING: Boxes of 1 and 10 vials.
SUPPLIER: Parke, Davis & Co.

Compazine Suppositories 2½ mg.

GENERIC NAME: Prochlorperazine.
INDICATIONS: New dosage form of prochlorperazine specifically designed for children; for control of nausea and vomiting.
SIDE EFFECTS AND CONTRAINDICATIONS: Usual side effects of ataractic drugs.
DOSAGE: Children 20-29 lbs., one suppository once or twice daily; 30-39 lbs., one suppository two or three times daily; 40-85 lbs., one suppository three times daily.
PREPARATIONS: Suppositories containing 2.5 mg. prochlorperazine.
PACKAGING: Boxes of 6 suppositories.
SUPPLIER: Smith, Kline & French Laboratories.

Dumogran

COMPOSITION: Anabolic hormones with vitamins and minerals.
INDICATIONS: During and following menopause and the male climacteric; for tissue atrophy and/or mild psychic disturbances in geriatric patients; in protein depletion and chronic debility following malnutrition, infection, trauma, etc.; and in osteoporosis (postmenopausal, senile, and other types).
SIDE EFFECTS AND CONTRAINDICATIONS: Certain patients may be overly reactive to either androgenic or estrogenic medication; patients should also be observed for edema; not recommended for patients who have or have had established or suspected mammary or genital malignancy.
DOSAGE: Average adult dosage, two tablets daily.
PREPARATIONS: Capsule-shaped tablets containing 4 mg. methyltestosterone, 0.008 mg. ethinyl estradiol, vitamins, and minerals.
PACKAGING: Bottles of 60 and 250 tablets.
SUPPLIER: Squibb.

Mycolog Ointment

COMPOSITIONS: Triamcinolone acetonide, neomycin, gramicidin, and nystatin.
INDICATIONS: Anti-inflammatory, antipruritic, antibacterial and antifungal ointment; indicated in cutaneous moniliasis, superficial bacterial infections, and various dermatitis conditions.
SIDE EFFECTS AND CONTRAINDICATIONS: None known.
DOSAGE: Apply a thin film to affected areas 2 to 3 times daily.
PREPARATIONS: Ointment containing in each gram: 1 mg. triamcinolone acetonide, 2.5 mg. neomycin, 0.25 mg. gramicidin, and 100,000 units nystatin.
PACKAGING: 5 and 15 Gm. tubes.
SUPPLIER: Squibb.

Plasmanate

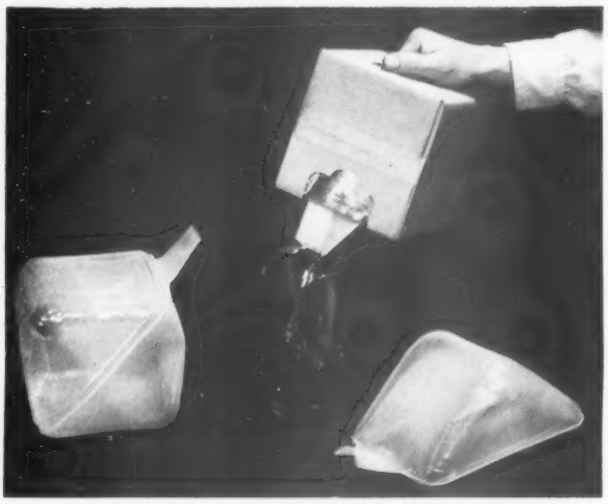
COMPOSITION: A 5% solution of human plasma proteins with stabilizers in 0.67% saline solution; has a *p*H of 6.75-7.25, is osmotically equivalent to plasma, and contains all essential amino acids.
INDICATIONS: Shock, hypoproteinaemia; for restoration of blood volume in shock due to burns, crushing injuries, etc., where loss of plasma fluids is predominant, not loss of red blood cells.
SIDE EFFECTS AND CONTRAINDICATIONS: Caution should be exercised in patients with normal or increased blood volume.
DOSAGE: Based on nature of the case and the response to therapy. Usual minimum effective dose is 250 to 500 ml.; rate of administration depends on response, and flow should be adjusted as patient improves; rates up to 17 ml. per minute have been well tolerated. In hypoproteinemia, usual adult dose is 1,000 to 1,500 ml.; rate of administration should not exceed 5 to 8 ml. per minute.
PREPARATIONS: A 5% solution of human plasma proteins.
PACKAGING: Bottles of 250 ml.
SUPPLIER: Cutter Laboratories.

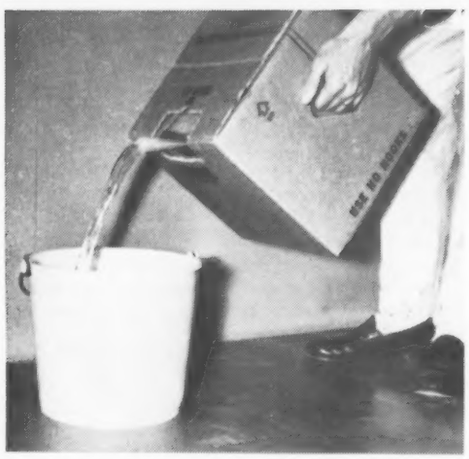
Notes + Suggestions

edited by CLIFTON J. LATIOLAIS

POLYETHYLENE CONTAINER FOR LIQUIDS

The Cubitainer®* is a novel type of container for storing and dispensing liquids. It is made of polyethylene resin and is encased in a corrugated paperboard box. Cubitainers are compatible with most commonly used hospital liquids with the exception



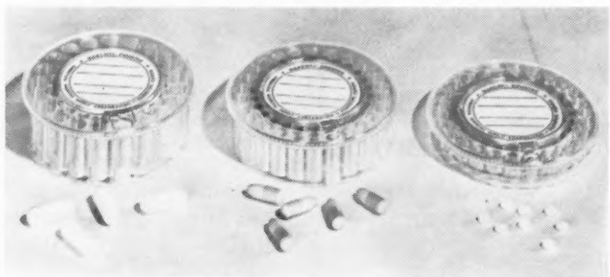


of organic solvents. They are unaffected by hydrochloric and sulfuric acids at room temperature. These square packages provide for maximum utilization of storage space and the weight is only 7¾ oz. as compared to 46 ounces for glass containers. Available in quart, gallon and 5 gallon sizes.

*Hedwin Corporation, 1600 Roland Heights, Baltimore 11, Md.

NARCOTIC DISPENSER

A new large model Narcotic-Counter Dispenser* designed to hold 20 size #00 capsules, or tablets with diameters up to ½ inch has been added to the regular line of Tomac Counters. Made of polystyrene, the counter can be washed or cold sterilized.



*American Hospital Supply Corp., 2020 Ridge Ave., Evanston, Ill.

HYDROCORTISONE CREAMS

At the request of the British Pharmaceutical Codex Revision Committee and Joint Formulary Committee, an investigation was made to determine the stability of hydrocortisone alcohol and hydrocortisone acetate in aqueous emulsified bases. (Hadgraft, J. W. and Price, S. A. P., Hydrocortisone Creams, *Pharm. J. 180*:420 (May 31) 1958.) From the results of the study, the authors conclude that aqueous creams of hydrocortisone alcohol and acetate prepared by simple pharmaceutical technique, are equally stable* in cetomarogol cream base and that the presence of a phosphate buffer at *p*H 7 is unnecessary. The suggested formula is as follows:

Hydrocortisone Alcohol (or Acetate)	1.0 Gm.
Chlorocresol	0.1 Gm.
Cetomacrogol Emulsifying Wax	9.0 Gm.
White Soft Paraffin	15.0 Gm.
Liquid Paraffin	6.0 Gm.
Purified Water, to make	100.0 Gm.

*Stability studies were carried out after one month storage at room temperature plus an additional six weeks at 45°C.

CELLULOSE SEALS FOR BOTTLES

A new brochure describing Celons®—how they are manufactured, the different sizes and types available, how to measure for proper size, etc.—is available from the Celon Company, P. O. Box 311, Muscatine, Iowa.

PORTABLE NARCOTIC DISPENSING UNIT

To facilitate dispensing efficiency, the pharmacy at Good Samaritan Hospital, Portland, Oregon utilizes a special portable narcotic dispensing unit. This unit contains a sufficient supply of narcotics for dispensing purposes, wheeled to the dispensing area each day and returned to the narcotic vault at night.

SUBMICRON FILTER

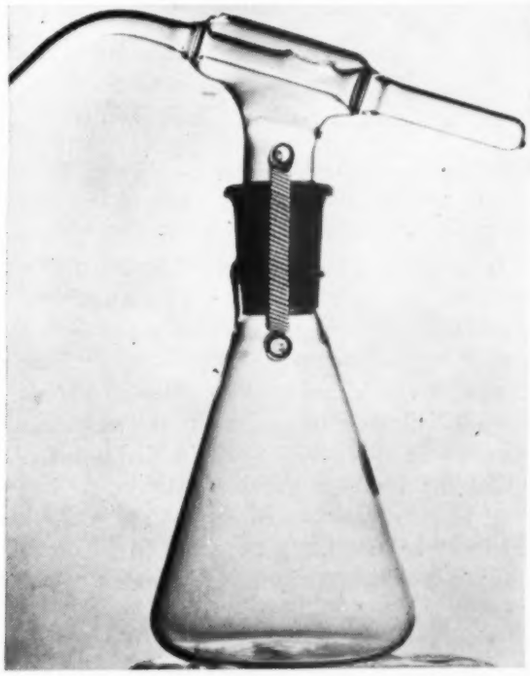
Model MF-25 Submicron Filter* is designed for laboratory filtration procedures. This filter, using the millipore cellulose ester membrane as the filter media, removes particulate matter as small as 0.45 micron.

Rate of filtration output is 25 to 100 gallons per hour. The long legs permit placing containers underneath and facilitate connection of inlet and overflow hoses to the stainless steel nipples. Total height is 20 inches.

*Available from Barnstead Still and Sterilizer Co., Lanesville Terrace, Boston 31, Mass.

VOLUMETRIC PIPETTER

The new volumetric pipetter* consists of a Pyrex delivery head and a reservoir flask. Both are supplied with interchangeable ground glass joints and hooks for attaching the connecting springs. The heads are calibrated for one specific volume ranging from 1 ml. to 100 ml. in any ½ ml. increment. Flasks are available in 300, 500, 1000 and 2000 ml. capacities.



The pipetter head is filled with a flick of the wrist and a forward tilt dispenses the accurate volume. The heads are calibrated in ml. of distilled water with an accuracy of plus or minus 1%. (Write for Bulletin MA-58.)

*Palo Laboratory Supplies, Inc., 81 Reade St., New York 7, N. Y.

News

Graduate Program Offered At Colorado

The University of Colorado School of Pharmacy has recently announced the establishment of a graduate hospital program leading to the Master of Science Degree. It is to be a twenty-two month program, combining an internship with an academic program.

Beginning with the 1959-1960 term, interested individuals may write for further information to Dean C. H. Waldon, School of Pharmacy, University of Colorado, Boulder, Colorado.

Special features of the program as noted in the announcement include the following:

1. Residency program at various approved Colorado hospitals—may be on a rotating basis.
2. Training at the Denver Poison Control Center.
3. Training in teaching pharmacology and pharmacy for nurses.
4. Residency stipend—the amount depends on the hospital.
5. Possible waiver of residency for those persons experienced in the field.
6. Outstanding hospital administrators will conduct hospital administration and management courses.
7. Research in the resident's field of interest.

► Two Residents in Pharmacy at the Veterans Administration Hospital in Los Angeles contributed to the publication entitled "Rounds of the Teaching Staff" by submitting an article on "The Chemistry and Pharmacology of Digitalis." This article was one of a series included in a symposium on the Cardiac Glycosides held at the Veterans Administration Hospital. The pharmacy residents who participated in this endeavor are both candidates for the Master of Science degree at the University of Southern California. The names of the residents are Miss Gloria E. Nomura and Mr. Francis R. Giannetti. Mr. Charles C. Towne is Chief of the Pharmacy Service and in charge of the overall residency program at the VA Center at Los Angeles.

► William H. McElroy has recently retired as Chief Pharmacist of the Akron General Hospital, a position he held since 1947. Mr. McElroy has been an active member of the Society for several years and has participated in numerous local and national programs in hospital pharmacy.

► Dean Edward Ireland of Loyola University School of Pharmacy and Dr. George F. Archambault, Chief, Pharmacy Branch, Division of Hospitals, U. S. Public Health Service, Washington, D. C., recently met with officials at the new Seamen's Memorial Research Laboratory in New Orleans to discuss pharmacy research and graduate education potentials. The Laboratory, dedicated in April, is part of the U. S. Public Health Service Hospital in New Orleans. Others participating in the conference included Frank Hollister, Deputy Chief, Pharmaceutical Service, New Orleans Public Health Service Hospital; Dr. John Walsh, Research Director, Seamen's Memorial Research Laboratory; William Hanna, Chief, Pharmacy Service, U. S. Public Health Service Hospital, New Orleans, Louisiana.

► Gloria Francke, Secretary of the ASHP, represented the Society at the opening of the Food and Drug Administration's Detroit District Headquarters on May 14. The Headquarters building—the first District FDA office to be opened in twenty-five years—was named the George Potter Larrick building in honor of FDA Commissioner Larrick.

NPC Sponsors Education-Industry Forum

Seventy-six teachers from all of the nation's pharmacy colleges are expected to attend the Pharmacy Education-Industry Forum which is to be held August 23-26 at Princeton, N.J. According to Carl K. Raiser, President of the National Pharmaceutical Council, the objective of the NPC Forum is to explain the philosophy and workings of the pharmaceutical industry to the educators.

The Forum, sponsored by 21 NPC member companies, marks the first time that leading pharmaceutical companies have joined to present a forum for pharmacy educators. More than 125 persons from all fields of pharmacy and health are expected to attend the three day Forum at the Princeton Inn.

The NPC in cooperation with the American Association of Colleges of Pharmacy, has developed a lecture-workshop format for the Forum. The program will consist of lectures in the morning and workshop sessions in the afternoon. Forum speakers will appear at each of the morning lectures. During the afternoon sessions they will conduct informal discussion periods with the pharmacy school representatives.

Guest speakers will include prominent physicians, executives from leading pharmaceutical firms, and well-known government officials. The Forum lectures will encompass the entire scope of the pharmaceutical industry, accenting the marketing and distribution aspects.

In a recent letter to the Deans of the nation's colleges of pharmacy, Dr. H. G. Hewitt, Chairman of the Executive Committee of the AACP, pointed out the opportunities presented by the Forum. Hewitt

urged the Deans to send faculty representatives who by virtue of their positions would best be suited to transmit to pharmacy students the information acquired at the Forum.

Raiser told the Committee members, "It is my hope that this Forum will be a milestone in the history of the pharmaceutical manufacturer-pharmacy educator relationship, and that it will lead to an even closer working relationship in the future for the betterment of the nation's health."

► VERONICA L. CONLEY, Secretary of the Committee on Cosmetics of the American Medical Association, has recently received a Ph.D. degree from the University of Chicago. Dr. Conley is the wife of Dr. Bernard Conley, Secretary of the American Medical Association's Committee on Toxicology.

Booklet on Poison Control Issued by Abbott

Abbott Laboratories has published a new booklet to aid Poison Control Centers in supplying physicians and hospitals with authoritative information on the symptoms and treatment of overdosage with newer pharmaceuticals.

The booklet lists selected Abbott products not likely to be listed in standard reference works because they are too new or contain a number of ingredients. Information given for each product includes ingredients, description, toxicity, and symptoms and treatment of overdosage.

With the rapid increase in the number of pharmaceutical products on the market, physicians are more frequently confronted with cases of overdosage resulting from accidental ingestion or large doses taken with suicidal intent. The Abbott booklet is designed to make information on the company's products available to Poison Control Centers for rapid dissemination to physicians and hospitals in emergencies.

The booklet has been distributed to all of the more than 170 Poison Control Centers currently in operation in the United States. It also will be made available on request to hospitals where cases of poisoning may be admitted for treatment and to physicians particularly concerned with treatment of such cases.

► DR. DONALEE L. TABERN, Head of the Radio-Pharmaceuticals Department at Abbott Laboratories, has recently retired after thirty-three years of service. Dr. Tabern has spoken to hospital pharmacists' groups and is well known throughout the profession.

Dr. Tabern received an Abbott Scientific Award in 1948 and in 1956 was given a Senior Abbott Research Award in special recognition of his outstanding work in radioactive drugs.

► JOHNSON & JOHNSON has recently announced a simple new "breathing tube" for artificial respiration. Called Resusitube, the device is said to be far more effective than any manual methods of artificial respiration now in use, and is based on the technique of mouth-to-mouth breathing.

► EXPANSION OF HOSPITAL SERVICES is primarily responsible for the sharp rise in hospital costs, according to a recent release from the American Hospital Association. This was pointed out during National Hospital Week, May 10-16 which is sponsored annually by the AHA.

Following the theme, "More Roads to Recovery," emphasizes that that the smallest and simplest hospital today can offer services that were unknown in even the great medical centers yesterday. The great medical centers today are developing the routine hospital services of tomorrow.

Vane M. Hoge Accepts AHA Appointment

Dr. Vane M. Hoge has recently been appointed Assistant Director of the Washington Service Bureau of the American Hospital Association.

Dr. Hoge is well known to the hospital field, having been one of the key Public Health Service officials in the early work leading to the enactment of the Hill-Burton Hospital Survey and Construction program. He organized and administered this extremely successful program.

Dr. Hoge, a graduate of the Jefferson Medical College, Philadelphia, entered the Public Health Service as an intern in 1928. Later he completed the course in hospital administration at the University of Chicago and then served as hospital consultant for the Public Health Service in Washington. He organized the PHS Hospital Facilities Section in 1940.

Subsequently this Section drafted designs for various types of hospitals and conducted research in hospital equipment, administration, and management. Later, Dr. Hoge and other Section staff engaged in planning for post-war hospitals and health centers in cooperation with the Commission on Hospital Care, sponsored by the American Hospital Association in the 1940's. These activities led directly to the enactment of the Hill-Burton Survey and Construction Act in 1946.

Dr. Hoge is a visiting lecturer to schools of hospital administration at the University of Chicago, University of Minnesota, Northwestern University, and Yale University. He is a former member of the Council on Hospital Planning and Plant Operation of the American Hospital Association. From 1951 to 1953, he served as a member of the Commission on Financing of Hospital Care. He has made numerous trips to South America, Europe, and Asia as consultant on health and hospital matters.

Students enrolled in Course in Hospital Administration at St. Louis University receive instruction in use of The American Hospital Formulary Service. The instructor, Mr. Norman Hammelman (shown at far right) is Chief Pharmacist at the Veterans Administration Hospital in St. Louis.

International Congress of the Pharmaceutical Sciences

The Scientific Section of the International Pharmaceutical Congress will meet for the Nineteenth International Congress of the Pharmaceutical Sciences in Zurich, Switzerland, September 6 to 10, 1959. Program plans have been announced by Professor Dr. K. Steiger-Trippi, Secretary of the Organization Committee.

Two objectives of the Congress as outlined by the Secretariat are: (1) to consider the question of the stability and stabilization of medicaments from different points of view; and (2) to give the opportunity to the scientists in the whole field of pharmacy to report on their scientific work.

Accordingly, "Stability and Stabilization of Remedies," will be the principal subject covered at the Congress with five international specialists in the field participating in a symposium. In addition, reports under the following subjects will be covered:

1. Pharmacognosy and cultivation of drugs.
2. Pharmaceutical chemistry and biochemistry.
3. Galenical pharmacy.
4. Biology and pharmacology.

The tentative program for the Congress is as follows:

Sunday, September 6

5:00 P.M. Session of the Council of the Scientific Section and of the Organization Committee.

8:30 P.M. Assembly and welcome of the participants.

Monday, September 7

9:30 A.M. Opening of the Congress.

Welcome by a representative of the Swiss authorities.

Introduction by the President of the Scientific Section, Prof. Dr. R. Ruyssen.

Greetings by the President of the International Pharmaceutical Federation, Sir Hugh Linstead.

10:00 A.M. Symposium: Stability and Stabilization of Medicaments—

Stability of Medicaments—general introduction, problems, methods of testing the stability, etc.—Prof. Dr. S. A. Schou, Copenhagen.

Decomposition of Medicaments Due to Physical Changes—Prof. Dr. Guillot, Paris, France.

Decomposition of Medicaments Due to Chemical Changes—Prof. Dr. E. H. Vogelenzang, Leyden, Belgium.

3:00 P.M. Communications in the Different Sections:

1. Pharmacognosy and Cultivation of Drugs.
2. Pharmaceutical Chemistry and Biochemistry.
3. Galenical Pharmacy.
4. Biology and Pharmacology.

Tuesday, September 8

9:00 A.M. Symposium: Stability and Stabilization of Medicaments (cont)

Decomposition of Medicaments Due to the Action of Bacteria and Fungi—Dr. Fust, Basle, Switzerland.

10:30 A.M. Communications in the Different Sections.

3:00 P.M. Communications in the Different Sections.

6:30 P.M. Tour of the Lake of Zurich by boat (dinner at Rapperswil).

Wednesday, September 9

9:00 A.M. Symposium: Stability and Stabilization of Medicaments (cont)

Decomposition of Medicaments Due to Auxiliary Substances and Containers of Remedies —M.T.D. Whittet, London, England.

10:30 A.M. Communications in the Different Sections.

3:00 P.M. Communications in the Different Sections.

Thursday, September 10

9:00 A.M. Discussion of the papers of the Symposium.

10:30 A.M. Final Session of the Congress.

11:30 A.M. Departure for the pharmaco-botanical excursion.

Friday, September 11

Visit to the pharmaceutical industries in Basle and Berne.

The authors of the scientific papers and all other participants are asked to send their registration to the secretariat of the Congress before June 15. The address is: Prof. Dr. K. Steiger-Trippi, Pharmaceutical Institute of Technology, Clausiusstrasse 25, Zurich, Switzerland.

Also, authors of scientific papers are asked to send the title and resume of their reports (one page typewritten) in duplicate, to the secretariat of the Congress not later than June 15.

News

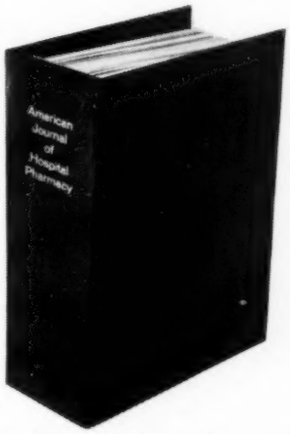
► GROVER C. BOWLES, JR., Director of Pharmacy Service, Baptist Memorial Hospital in Memphis, Tennessee recently addressed the Midwest Pharmaceutical Advertising Conference on "The Hospital as an Expanding Market for Pharmaceuticals."

Mr. Bowles has served as president of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, the Tennessee Society of Hospital Pharmacists, the Memphis Retail Drug Association, and was secretary of the Hospital Pharmacy Section of the Fourth Pan-American Congress of Pharmacy and Biochemistry. Currently, he is a member of the Council of the American Pharmaceutical Association, a contributing editor of the AMERICAN JOURNAL OF HOSPITAL PHARMACY, and Hospital Pharmacy Editor of the *Modern Hospital*.

► JOHN N. MCDONNELL has recently been named General Manager of the Pharmaceutical Laboratories Division of Schieffelin & Co. Dr. McDonnell was formerly with Schering Corporation and has served as editor of the *American Professional Pharmacist*. He is a charter member of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS and was an active participant in the organization of the ASHP.

► GEORGE F. ARCHAMBAULT, Pharmacy Director, Chief, Pharmacy Branch, Division of Hospitals, U. S. Public Health Service, spoke on "Law Affecting Hospital Pharmacy," at a recent Hospital Law Institute held in Norfolk, Va. The Institute was sponsored by the Tidewater Hospitals Council and was held at the Norfolk General Hospital on May 18.

Journal Binders Available



A loose-leaf binder for the AMERICAN JOURNAL OF HOSPITAL PHARMACY is now available from The Hamilton Press, Hamilton, Illinois. The new binder has been designed for THE JOURNAL and will hold the twelve issues satisfactorily. The binder is brown in color and "American Journal of Hospital Pharmacy" is embossed on it in gold. The binder is 9 by 12¼ inches with the spine measuring 4 inches.

The cost of the binder is four dollars ($4.00) each and orders may be directed to The Hamilton Press, Hamilton, Illinois.

A few copies of the loose-leaf binders for THE BULLETIN OF THE AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, which was published on a bi-monthly basis from 1946 through 1957, are available at two dollars ($2.00) each. On ordering binders, please indicate clearly whether you want binders for THE JOURNAL (twelve issues) or THE BULLETIN (six issues).

Sister Mary Florentine, Chief Pharmacist at Mount Carmel Hospital, Columbus, Ohio, was responsible for the exhibit shown below. It was prepared for the Annual Health Fair in Columbus

SELECTED PHARMACEUTICAL ABSTRACTS

and summaries of other articles interesting to hospital pharmacists

edited by CLIFTON J. LATIOLAIS, HENRY J. DEREWICZ *and* LEO F. GODLEY

DETERMINATION OF MAGNESIUM IN MIXTURES

Complexometric Determination of Magnesium in Some Prescription Mixtures, Terpilowski, J. and Szmyt, K., Acta Poloniae Pharmaceutica 15:285, 1958.

The authors have utilized the complexometric volumetric method for determining the content of magnesium in some of the commonly used prescription mixtures.

They established the most favorable conditions for dissolving the individual mixtures and for separating out of these mixtures those components which interfere in their determination. For this separation of interfering components they utilized columns filled with the anionite Amberlit IRA-400 and, in the case of bismuth salts, hydrolysis.

By their experiments the authors demonstrated that the complexometric volumetric method makes possible a simple, rapid and accurate determination of magnesium in complex prescription mixtures.

AUTHOR'S ABSTRACT

RUTIN ASSAY

Colorimetric Determinations of Rutin by Means of Uranyl Salts, Bross, T. and Bilinska, U., Acta Poloniae Pharmaceutica 15:39, 1958.

It has been ascertained that rutin solutions yield a color reaction with a solution of $UO_2(CH_3COO)_2$. This reaction might be utilized for the rapid and simple determination of rutin.

The authors have made experiments in order to find the coordination number of the produced compound. On the basis of obtained results it might be concluded that the uranyl ions combine with rutin in proportion of 1 to 1.

AUTHOR'S ABSTRACT

DRUG SYNERGISM IN PAIN RELIEF

Drug Synergism (Potentiation) in Pain Relief in Man: Papaverine and Morphine, Macris, S.G.; Gravenstein, J. S.; Reichle, C. W.; and Beecher, H. K., Science 128:84 (July 20) 1958. (Harvard Medical School, Massachusetts General Hospital, Boston.)

Drug synergism in the relief of pathological pain in man is clearly demonstrated with analgesic drugs. On comparing papaverine with morphine in pathological pain, an example of drug interaction was observed.

In a series of sixty-nine patients having pain rated as "severe" or "moderate" before medication was given, forty-five received morphine, 10 mg., alternating with papaverine, 50 mg., and twenty-four received morphine, 10 mg., alternating with papaverine, 100 mg. These weights refer to the salts and were contained in one ml. of solution. The drugs were injected subcutaneously, per 70 Kg. of body weight. After a drug was given, pain was recorded as "unchanged," "less than half gone," "more than half gone," or "disappeared." The relief reported by the patient was then rated. Only pained data were evaluated—that is, data for doses of morphine and papaverine given to the same patient for the same degree of pain.

Analysis of the results shows that when the pain level is controlled and correlated data are used, papaverine, 50 mg., and 100 mg., is consistently less effective than morphine, 10 mg. In fact, papaverine in the larger dose exhibited less analgesic effect than in the smaller dose.

In the group in which both morphine and papaverine were administered, morphine was found more effective when given as the second drug following papaverine than when given as the first drug—that is, preceding papaverine.

It is therefore concluded that morphine given as the first drug for pain postoperatively was much less effective than the identical dose of morphine given after papaverine. Whether this is true for other analgesic drugs is not known. It is known that interaction among drugs in the experimental situation described does occur. No clue about the nature of this interaction is available.

GLORIA FRANCKE

CONSIDERATIONS IN PARENTERAL MANUFACTURING

Basic Decisions Related to Preparation of Parenterals, Avis, K. E., Am. Profess. Pharmacist 24:926 (Dec.) 1958. (Philadelphia College of Pharmacy, Philadelphia, Pa.)

The author presents many of the professional considerations required in deciding upon parenteral manufacture in the hospital pharmacy. Such questions as position of economy, economy, controls, records, stability of formulations, filtration, containers and closures are explored by the author with major emphasis upon the pharmacist's integrity and competence. The author stresses that the matter of parenteral manufacture be approached with a cautious and intelligent respect.

HENRY J. DEREWICZ

REPOSITORY POLLEN EXTRACT

The Treatment of Pollinosis by Means of a Single Annual Injection of Emulsified Extract, Brown, E., Annals Allergy, 18:34 (Jan.-Feb.) 1959.

The authors propose an emulsified repository extract of various grass pollen which may be injected once during a twelve month period in order to prevent the symptoms of pollinosis and to eliminate frequent injections during the year. The use of the repository extract is based upon the hypothesis that a patient may be given a dose of extract probably past below his limits of tolerance. The author, in addition, discusses preparation, standardization and administration of the extract. Emulsifying agents for the standardized extract consists of Arlacel A and Drakeol in a ratio of 1:9. In addition, the author proposes the use of epinephrine or an antihistaminic agent incorporated in the final product in order to provide the patient with greater safety.

HENRY J. DEREWICZ

NEW WATER-INSOLUBLE WHOLE RAGWEED POLLEN COMPLEX

The Clinical Evaluation and the Preparation and Standardization of Suspensions of a New Water-Insoluble Whole Ragweed Pollen Complex, Fuchs, A. and Strauss, M., J. of Allergy 30:66 (Jan.-Feb.) 1959. (Division of Allergy, New York-Bellevue Medical Center, N. Y. City.)

The authors describe a method for preparing a suspension of a new water-insoluble whole ragweed pollen complex which is believed to be more representative of all the allergenic components as they appear in the pollen and in a form which leads itself to slow absorption. In contrast to previous standardization methods, the suspension can be standardized by a weight method which takes into account all antigenic fractions present. This is accomplished by correlating the nitrogen value and the weight of the alum-precipitated pyridine whole ragweed complex. When administered to a series of 78 adults, highly sensitive to ragweed pollen, a greater tolerance was noted, in addition to excellent clinical relief in extremely sensitive patients. Briefly, the extraction process involves the use of an extracting fluid consisting of one part pyridine and one part 0.3% sodium bicarbonate solution. Five grams of the ragweed pollen was allowed to extract with 100 ml. of the extracting fluid. Following bacterial filtration, one part sterile water was added to one part of the filtrate. To this was added one

part of a solution of 2% potassium aluminum sulfate in 0.25 N Sulfuric acid slowly in order to precipitate the whole ragweed complex. After centrifuging and washing the precipitate was suspended and standardized by means of a phosphotungstic acid-precipitable nitrogen determination.

HENRY J. DEREWICZ

BORATE DETERMINATION

The Qualitative Determination of Borates by Polyvinyl Alcohol, Mante-Bori, A., Sciarra J. and Martorana C., Drug Standards, 27:15, (Jan.-Feb.) 1959. (College of Pharmacy, St. John's University, Jamaica, N.Y.)

A comparative study of the several qualitative tests for the detection of borates is made, including the official tumeric paper and ignition test plus a recently suggested polyvinyl alcohol-iodine test. Used in the tests were solutions of boric acid, sodium tetraborate and sodium perborate. The proposed test involves acidifying a solution of borate, after which the addition of iodine and polyvinyl alcohol produces a distinct blue color. Conversely, the color can be used to identify the presence of either the borate or the polyvinyl alcohol. The tumeric paper test for detecting borates was found to be somewhat misleading and should be reinvestigated. However, the sensitivity of the ignition test was found to increase through the use of a platinum loop.

HENRY J. DEREWICZ

GREATER STABILITY FOR CALAMINE LOTION

Effects of Electrolytes on the Stability of Zinc Oxide Suspensions, Koh Y. and Hopponen R., Drug Standards, 27:21, (Jan.-Feb.) 1959. (School of Pharmacy, University of Kansas, Lawrence, Kans.)

A study is made of the effects of a number of salts of citric, tartaric, succinic and malic acids on the stability of the zinc oxide suspensions. Because of certain disadvantages found in the official Calamine Lotion, the above study was extended to develop a calamine lotion formula possessing more advantages over the present official formulation. To simplify the procedure and reduce experimental settling time, zinc oxide suspensions were used in a 10 percent concentration. Results of tests indicated that citrates and bitartrates in the absence of any other suspending agents markedly reduce the settling rate of zinc oxide suspensions. In the study, the above stabilizing salts were also combined with various suspending agents. Results indicate that citrates and bitartrates reduce the settling rate of zinc oxide with Veegum. Extension of the study indicated that the use of 1 percent sodium carboxymethylcellulose and 0.5 percent of Veegum as suspending agents resulted in an excellent calamine lotion. Following are the formulas of the suggested calamine lotions:

	Formula A	*Formula B*
Calamine	8	8
Zinc Oxide	8	8
Glycerin	2	3
Sodium bitartrate	1	
Veegum	1	0.5
Sodium citrate	0.25	
CMC type 70H		1.0
Dioctyl sodium sulfosuccinate	0.03	0.05
Span 20	0.1	
Distilled Water q.s.	100	100

HENRY J. DEREWICZ

GLYCEROL FORMAL

A Note on Glycerol Formal as a Solvent in Toxicity Testing, Sanderson, D. M., J. Pharm. and Pharmacol. 11:150 (Mar.) 1959. (Chesterford Park Research Station, Nr. Saffron Walden, Essex, England.)

In toxicological investigations, the chemical to be investigated must first be dissolved in or diluted with a suitable solvent. Such a solvent must of course have good solvent powers for a wide range of material, be chemically inert in itself, and be of low toxicity so as not to interfere with the toxicity test itself. A suitable solvent should, furthermore, be of low viscosity, low volatility, capable of complete miscibility with water to form a neutral solution and be available at reasonable expense. These desirable properties limit the number of candidate materials to be used as solvents.

The author describes how a simple screening test was performed on selected materials to determine if sufficiently large doses could be injected without detectable effects on the animal, which would interfere with a toxicological investigation. Among these candidate materials, glycerol formal, a condensation product of glycerol and formaldehyde, was studied in greatest detail. This material has been used industrially on the ton scale as a solvent for cellulose acetate, without special precautions, and has yet produced no detected hazards. The investigation found glycerol formal to be non-toxic on microscopic pathology when administered to rats, mice and guinea pigs. At higher doses, the only specific effect found was narcosis. Its mild irritation was found to be less than that of the now commonly used solvent, propylene glycol. Glycerol formal appears to be a useful addition to the range of solvents suitable for use in acute toxicity tests.

THOMAS E. ARKINSON

STABILITY PREDICTION

The Solution Degradation of the Antibiotic Streptovaricin, Garrett, E. R., J. Am. Pharm. Assoc., Sci. Ed. 48:169 (Mar.) 1959. (Research Division, Upjohn Company, Kalamazoo, Mich.)

The prediction of stability and pharmaceutical formulation of compounds of unknown structure is especially important in the antibiotic age. The kinetics of solution degradation of the antibiotic complex of the structurally unknown streptovaricins are studied spectrophotometrically and equations obtained to characterize degradation as a function of pH. Bioassay has been correlated with spectra and conditions given for maximum stability of assay standards and preservation of yield. A mechanism is proposed that accounts for the available data and predicts the properties of degradation intermediates. The application of an analog computer to kinetic interpretation is given. Kinetic conditions for the differential assay of streptovaricin C were derived.

AUTHOR'S SUMMARY

PROCAINE AND TETRACAINE ASSAY

Procaine Hydrochloride and Tetracaine Hydrochloride Combined in Cartridges for Dental Anesthesia, Auerbach, M. E. and Tuckerman, M. M., J. Am. Pharm. Assoc., Sci. Ed. 48:194 (Mar.) 1959. (Sterling-Winthrop Research Institute, Rensselaer, N. Y.)

From a 1 ml. sample, total anesthetic is computed from the ultraviolet absorption of the extracted anesthetic bases in strongly acid solution. The minor constituent, tetracaine hydrochloride, is determined by simultaneously diazotizing the procaine and nitrosating the tetracaine. A salt, soluble in water, is produced from the procaine diazonium chloride by coupling it quantitatively with Chicago acid (1-amino-8-naphthol-2,4 disodium sulfonate). The nitroso-tetracaine is then extracted from the alkaline medium with chloroform and determined spectrophotometrically.

AUTHOR'S SUMMARY

MULTIVITAMIN PREPARATIONS, POTENCY PREDICTION OF

The Prediction of Expiration Dates for Multivitamin Preparations by Accelerated Storage Tests, McLeod, H.A., Pelletier, O., and Campbell, J.A., Can. Pharm. J. 91:173-80, 1958 (Dept. Nat'l. Health and Welfare, Ottawa).

From data obtained from the study of the degradation of vitamin A, thiamin, and ascorbic acid in three common multivitamin liquid preparations at elevated temperatures by using the potency predicted at lower temperatures by the method of Garrett (C.A. 50,8139c) an accurate means for estimating the potency of a vitamin and its confidence limits as far as one year in advance were established. The calculations involved are given, as well as a simplified graphical method.

S.P. MARINO, CHEMICAL ABSTRACTS, 53,6491

TOLBUTAMIDE ASSAY

A Colorimetric Reaction for Tolbutamide, McDonald, H., Sawinski, V., Texas Repts. Biol. and Med., 16:479 (Winter) 1958.

A colorimetric method for estimating tolbutamide in aqueous solution is proposed. The assay involves a reaction between tolbutamide and the following reagents, added in a specific order and concentration: 2-naphthol, sodium nitrite and concentrated sulfuric acid. The reaction is terminated with the production of a red color. The method is found to be applicable to the determination of tolbutamide over the range of concentrations extending from the levels encountered in therapeutic studies up to those employed in purely chemical studies, i.e. the range of approximately 5 mg. to 1 Gm. per 100 ml. of solution.

HENRY J. DEREWICZ

ORANGE FLUIDEXTRACTS, PREPARATION OF

Production and Evaluation of Orange Fluidextracts, Bogs, U and Meinhard, J., Pharmazie, 13:393-5, 1958 (Martin Luther Univ., Halle, Ger.).

A simplified percolation process results in a preparation with a volatile oil content as high as that in a preparation made by the repercolation process of D.A.-B.VI. A menstruum strength of one part 70% alcohol to two parts water and prewetting before percolation are recommended. Standards for orange peel (bitter and sweet) are badly needed as the quality of the preparations depends essentially on good quality peel. The peel should be handled and stored in large fragments, using well closed containers, and comminuted only just before use.

G.M. Hocking, Chemical Abstracts 53,651e

STABILITY OF GLUCOSE SOLUTIONS

The Effect of Selected Additives on the Stability of Glucose Solutions, Parke, R., Sperandio, G., Parenteral Drug Assoc. 13:17 (Mar.-Apr.) 1959.

A method was developed for the analysis of color in aged glucose solutions. Fifteen selected organic compounds were studied for their effect on the stability of five percent glucose solutions. A series of buffered and nonbuffered glucose solutions containing these additives was subjected to accelerated aging and stability was determined. Results indicated that neither initial pH, pH change, nor final pH bore any relationship to the extent of decomposition of the solutions as evidenced by color formation. The concentration of the additives used could not be correlated directly or inversely with the colorant-inhibiting power of the majority of the solutions studied. It was found that the chemical type of the additive used was of primary importance in its successful inhibition of colorant formation.

Compounds of the alcoholic type improved the stability of glucose solutions the most. Three types of alcoholic compounds, monohydroxy alcohols, diols, and polyols, were further investigated. Although results pointed to a lack of the definite association of a structure-to-activity relationship in most cases, it was confirmed that the container-closure system affects the stability of a parenteral product and that 1,6-hexanediol afforded the greatest degree of stabilization of all compounds studied. Limited pharmacologic tests showed that 1,6-hexanediol was of low toxicity, low irritancy, and low hemolytic activity in the concentration in which it was employed as the stabilizer of glucose solutions. Additional studies illustrated the inability of the diol to alter the biochemical availability of glucose from the glucose-diol solution. The continued consideration of this compound as a stabilizing agent for glucose solutions is recommended.

A. Gordon Moore

BARIUM SULFATE SUSPENSION

Suspension of Barium Sulfate for X-Ray Contrast: Stabilizing Agents. Proenca do Cunha. A., Bol. Escola Farm., Uni. Coimbra (Port.) 15/16:210 (1955-56).

Suspensions of barium sulfate with good stability were made by using a combination of sodium alginate, small amounts of cellulose esters (especially carboxymethyl sodium) and pectin. The pectin also corrects the earthy taste of barium sulfate. X-Ray studies showed good adhesiveness and distribution in the intestinal mucosa. A recommended formula is: barium sulfate 48.15, sodium carboxymethylcellulose 0.65, sodium alginate 0.68, pectin 0.15, saccharin sodium 0.05 and sucrose 1.0.

G. M. Hocking, Chemical Abstracts 53:1634 e

ENTERIC COATED GELATINE CAPSULES, PREPARATION OF

A Contribution to the Preparation of Enteric Coated Gelatine Capsules, Mandak M., Zathurecky L., and Brunclikova D., Ceskoslovenska Farmacie (Czechoslovakia) 8:66 (Mar.) 1959.

The following formula for the preparation of gelatin mass which afterwards is to be treated by formaldehyde proved to be the best: gelatine 30 Gm., glycerin 30 Gm., mucilage of gum acacia 3 Gm., water 37 Gm. After undergoing the action of formaldehyde the capsules were tested with respect to their resistance against artificial gastric or duodenal juice. Best results were obtained by treating the capsules by 5% alcoholic solution of formaldehyde during 8 minutes. According to the *Czechoslovak Pharmacopoeia*, 2nd Ed., the same results are reached when immersing the capsules into 1.11% alcoholic solution of formaldehyde for 1 hour. The authors therefore suggest the revision of the due monograph of the *Czechoslovak Pharmacopoeia.*

Hubert Zacek

EMULSION BASE FOR OPHTHALMIC USE

Use of an Aqueous Emulsion Base for Ophthalmic Medication, Sheth, U. K., Valame, V. P., Indian J. Pharm. 21:71 (Mar.) (1959). (Department of Pharmacology, Seth G. S. Medical College, Parel, Bombay-12, India).

The disadvantages associated with the local application of ophthalmic drugs by means of aqueous solutions and ointment bases has been significantly reduced through the use of an aqueous emulsion base of the oil-in-water type. Evaluations of the base were carried out in rabbits. Results indicate that the base itself produces no irritation of conjunctiva or cornea and is well tolerated. When therapeutic agents were combined with the base, the duration and intensity of action were identical with that of ointment bases. Stability and potency of the emulsion base have been demonstrated and at the present time clinical trials are being conducted. Below is the suggested formula for the base:

Tween 80	0.5%
Methylcellulose	0.5%
Chlorobutanol	0.5%
Mineral oil	51 to 58% (w/v)
Aqueous buffer q.s.	

Henry J. Derewicz

CURRENT LITERATURE

. . . also calling your attention to the following articles appearing in recent hospital and pharmaceutical journals

. . . . . .

ADMINISTRATION

—Dispensing

Builder, R.: Automatic Stop Orders . . . How Should Stop Orders Be Handled?, *Hosp. Pharm.* (Canada) 12:64 (Mar.-Apr.) 1959.

Coleberry, Norah: Automatic Stop Orders . . . Practical Experience with Stop Orders, *Hosp. Pharm.* (Canada) 12:65 (Mar.-Apr.) 1959.

—Purchasing

Skolaut, Milton W.: How the Pharmacist Can Help Solve Problems in Purchasing Medical Supplies, *Hospitals* 32:61 (Nov. 1) 1958.

Vandermade, Minor, Jr.: Taking the Stigma Out of Standardization, *Hospitals, J. A. H. A.* 33:52 (May 1) 1959.

EDUCATION

Sister Mary Gertrude Boland: Personal Professional Development, *Hosp. Progress* 40:152 (May) 1959.

INDUSTRY

Baruch, John A.: The Drug Industry Looks at Hospitals, *Hospitals, J.A.H.A.* 33:51 (Apr. 1) 1959.

OUTPATIENT PRESCRIPTIONS

Berger, Calvin: A Retail Pharmacist's Thinking on Outpatient Prescriptions, *J. Am. Pharm. Assoc., Pract. Pharm. Ed.* 20:250 (May) 1959.

PARENTERAL SOLUTIONS

Kipp, Robert: Central Sterile Supply Under Pharmacy Control, *Hosp. Pharm.* (Canada) 12:63 (Mar.-Apr.) 1959.

PERSONNEL

Martin, Eric W.: How to Recruit, *J. Am. Pharm. Assoc., Pract. Pharm. Ed.* 20:266 (May) 1959.

Parks, Lloyd: Recruitment Tools, *J. Am. Pharm. Assoc., Pract. Pharm. Ed.* 20:262 (May) 1959.

PROFESSIONAL RELATIONS

Archambault, George F.: Hospital Pharmacy—Hospital Dentistry Relationships, *J. Oral Surg., Anesth. and Hosp. Dent. Serv.* 17:22 (Mar.) 1959.

PHARMACOLOGY

Anon.: The Efficacy of Opiate and Non-Opiate Analgesics Compared with Morphine, *Am. Profess. Pharmacist* 25:304 (May) 1959.

DRUG EVALUATIONS

by the Council on Drugs of the American Medical Association

► THE FOLLOWING MONOGRAPHS and supplemental statements on drugs have been authorized by the Council on Drugs of the American Medical Association for publication and inclusion in *New and Nonofficial Drugs*. They are based upon the evaluation of available scientific data and reports of investigations. In order to make the material even more valuable, dosage forms and preparations of individual drugs have been added to the monographs. These dosage forms and preparations were not taken from material published in the *Journal of the American Medical Association* by the Council on Drugs; rather, they were obtained from such manufacturers' brochures, news releases, etc., which were available to us at the time of publication. An attempt has been made to make the list of dosage forms as complete as possible. However, no guarantee can be made that the list of preparations is complete and it is suggested that hospital pharmacists consult manufacturers' releases for additional dosage forms and preparations.

The issues of the *Journal of the American Medical Association* from which each monograph has been taken is noted under each monograph. Monographs in this issue of the JOURNAL include those published in the *A.M.A. Journal* for March 7, 1959.

Notice

New and Nonofficial Drugs 1959 is now available from your local bookstore and from the publishers, J. B. Lippincott Company, Philadelphia, Pa. This 1959 edition contains monographs of drugs evaluated by the Council on Drugs of the American Medical Association and published in the Journal of the A.M.A. to January 1, 1959. The index listed below contains those drugs evaluated and published between December 20, 1958 and March 14, 1959.

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Report to the Council

The Council has authorized publication of the following report. Nonproprietary terminology is used for all drugs that are mentioned; when such terminology is not considered to be generally well known, its initial appearance is supplemented by parenthetic insertion of names known to be applied to commercial preparations. H. D. KAUTZ, M.D., *Secretary*

CURRENT STATUS OF THERAPY IN BRONCHIAL ASTHMA

MAURICE S. SEGAL, M.D., BOSTON

► BRONCHIAL ASTHMA is a distressing and common form of acute, recurrent, or chronic bronchial inflammation and obstructive emphysema, usually of allergic origin. The acute paroxysm of bronchial asthma may last for hours or recur in varying degrees of severity for days. Finally, a state of intractable asthma, during which the episode is continuous and refractory to treatment, may result. In this state the patient presents a picture of marked physiological imbalance. Evidence of hypoxia, cyanosis, dehydration, disturbed psyche, peripheral vascular collapse, and further disturbances may be noted because of changes induced by the widespread use of drug therapy. Death is more commonly due to asphyxia resulting from the plugged and obliterated bronchi and bronchioles and from oversedation; it is also due to the failure of endogenous discharge of adrenal hormones necessary in the defense mechanism against stress, and, in more recent years, particularly to steroid sequelae.

Medical Management

The successful management of the patient with chronic bronchial asthma requires a very careful consideration of the responsible factors in bronchial asthma. Such factors include allergic factors (inhalants, ingestants, contactants, injectants), common colds, paranasal sinus disease, bronchitis (allergic, asthmatic), physical factors (seasonal and climatic influences), psychosomatic factors, and miscellaneous factors (exertion, fatigue, endocrine influence, nonspecific pulmonary irritants, infections).

Every attempt should be made to determine the responsible antigens. If a detailed history is inconclusive as to the cause of a patient's bronchial asthma, then scratch testing and intradermal testing may be resorted to. Removal of the offending allergen (allergic cleanliness) and a trial with specific hyposensitization should be promptly instituted in all cases whenever possible. Further therapy should be directed toward removing the contributory factors. Because search for the responsible agents is difficult and often completely unsuccessful, emphasis on the allergic approach to management should not exclude physiological therapy.

Epinephrine.—Epinephrine has been employed in various modifications, concentrations, and routes. Toxic reactions, intolerance, and fastness are more commonly observed with overdosage and repeated parenteral use. Deaths have been reported after intravenous administration. In general, epinephrine given parenterally is limited in its value for the relief of the acute attack. Unfortunately, few physicians or patients limit the dosage to the proper and effective subcutaneous injection of 0.2 to 0.3 cc. of a 1:1,000 dilution of epinephrine hydrochloride. Generally, larger doses at frequent intervals are resorted to, especially when self-administered. The use of the hypodermic needle for self-medication is encouraged too often; the epinephrine-fast state is encountered most commonly in these patients. We have not observed any value from preparations of epinephrine 1:500 in oil.

Most patients in status asthmaticus are epinephrine-fast, and the repeated use of all epinephrine preparations should be avoided until epinephrine sensitivity is restored. We have made a rule of never adding epinephrine to the so-called intravenous cocktail (i. e., intravenous infusion of aminophylline, iodides, dextrose, etc.).

Bronchodilator Aerosols.—Acrosols of sympathomimetic drugs, such as 2.25% racemic epinephrine (Vaponefrin) hydrochloride, isoproterenol (Aludrine, Isuprel) hydrochloride 1:2000, a combination of 2.5% racemic epinephrine hydrochloride with 0.5% atropine sulfate (Dylephrin), or a combination of 0.4% isoproterenol sulfate with 2% phenylephrine hydrochloride (Nebu-Prel) have proved to be of great value for the relaxation of bronchospasm. As little as approximately 0.05 to 0.10 cc., nebulized by three to six compressions of a hand bulb, may abort or relieve a mild bronchospastic episode. We have observed clinical and laboratory improvement with administration of these agents.

Recently, epinephrine and isoproterenol have been added to Freons in the form of simple pocket units (Medihaler-Epi and Medihaler-Iso) designed to deliver measured aerosol dosages. The Medihaler-Iso unit is popular with patients and produces improvement in timed vital capacity relationships as tested in those with mild or moderate attacks of bronchial asthma. The class of Freons used to power this has been described as free of toxicity. More recently, a Freon-powered pocket unit has become available with an ingenious reservoir chamber with a self-cleaning, baffling device (Nebu-Halent). This device makes it possible to deliver finer, smaller particle-sized aerosols of bronchodilator agents or other therapeutic aerosols as prescribed by the physician. We were able to determine that in mild paroxysms of bronchial asthma three inhalations with this device, and in moderately severe paroxysms six inhalations, brought effective clinical relief and improvement in timed vital capacity relationships.

More severe bronchospasm may require 0.5 to 1.0 cc of one of these bronchodilator agents nebulized continuously with oxygen or with the simple Eliot air-pump unit made by the National Cylinder Gas Division of the Chemetron Corp. This treatment generally requires 10 to 15 minutes at a flow rate of four liters per minute.

Aminophylline.—Patients vary in their tolerance to aminophylline. Some become more alert; others become drowsy; many become nauseated and even vomit; and still others complain of palpitation and sweating.

Oral Route: For the prevention of mild but chronic attacks of bronchoconstriction, aminophylline may be given orally, around the clock. The addition of antinausea factors (local and central acting) to aminophylline has made possible the oral administration of larger, effective doses, with or without the addition of ephedrine, iodides, or a barbiturate. A combined preparation containing 300 mg. of aminophylline, 150 mg. of aluminum hydroxide, and 30 mg. of ethyl aminobenzoate (Cardalin), or a preparation containing 200 or 250 mg. of aminophylline, with 15 mg. of ephedrine hydrochloride or 25 mg. of phenobarbital and 15

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or 30 mg. of pentobarbital sodium, 150 mg. of aluminum hydroxide, and 15 mg. of ethyl aminobenzoate (Dainite) is most helpful when the dose is carefully tailored for the individual patient's needs and tolerances.

Rectal Route: For more persistent attacks, aminophylline should be administered rectally in doses of 300 to 600 mg. in 15 cc. of tap water every 8 or 12 hours. For children, the dose may be reduced to 60 to 200 mg. The available suppositories are not of equal value.

Intraveuous Route: Aminophylline should be given intravenously for severe paroxysms of coughing or wheezing not relieved by epinephrine or bronchodilator aerosols or by aminophylline given rectally. For an attack which has persisted for less than 12 hours, 250 mg. in 10 cc. of water for injection usually brings prompt relief. For a more protracted attack, the dose should be 500 mg. in 200 cc. of water for slow intravenous injection. These infusions may be repeated at intervals of 8 or 12 hours. Syncope and peripheral vascular collapse may be observed if the rate of injection is too rapid (1 cc. per minute is suggested).

For a severe acute attack of bronchial asthma occurring at home which has failed to respond to self-administered bronchodilator aerosols, epinephrine, sedation, or oral forms of aminophylline, the following routine may be most helpful: 1. A dose of 500 mg. of aminophylline in 20 cc. of solution may be given intravenously. 2. If no lasting relief is observed in half an hour, 0.2 cc. of epinephrine gel (Sus-Phrine) may be given subcutaneously. 3. If no lasting relief is observed in 15 minutes, 75 mg. of meperidine (Demerol) hydrochloride may be given subcutaneously.

If the patient has not previously used adrenergic agents, the order should be reversed to epinephrine gel, aminophylline, and meperidine hydrochloride. The attending physician should move quietly, yet act quickly, with assurance and empathy. The patient who does not respond satisfactorily in one hour's time would benefit most by proper hospitalization.

Continuous Infusion Technique: If intravenous injections of aminophylline become necessary one or more times daily for as long as a week, the continuous infusion technique should be employed. The patient should be hospitalized. A solution is made containing 500 mg. of aminophylline in each liter of 5% dextrose in water. Three liters should be given in 24 hours, with a flow rate of 30 drops per minute. If improvement follows after one or two days of such therapy, the infusions then may be given intermittently, e. g., from 9 a. m. to 9 p. m. daily, reducing the total to 1,500 cc. For the very sick patient, it may be necessary to continue these infusions for as long as 10 days. During convalescence, aminophylline should be given rectally instead of intravenously.

By means of pulmonary function studies, we have demonstrated the presence of latent bronchoconstriction in the patient who has completely recovered. Hence, in these patients, orally given aminophylline in combination with aluminum hydroxide and ethyl aminobenzoate should replace the rectally given aminophylline used during convalescence.

Intermittent Positive Pressure Breathing Therapy.—The use of pressure breathing is based on the creation of a pressure gradient from the mouth down to the pleural space. In the intermittent types, the gas mixture is supplied in the inspiratory cycle, usually through a face mask. There are several effective types of mask apparatus units which supply intermittent positive pressure breathing in inspiration. We have found the Bennett-type cycling valve and the new, extremely sensitive Mark 7 unit most satisfactory for administering positive pressure breathing, especially when combined with inspiratory bronchodilator aerosols. The patient completely controls the cycling of the valve by his own respiratory rhythm. An active inflation of the lungs occurs during inspiration under positive pressure from the cycling valve. The rapid release of pressure at the start of expiration is followed by a high velocity expiratory gas flow. This, combined with the release of bronchoconstriction which follows the simultaneous inhalation of bronchodilator aerosols, promotes better bronchial drainage. We employ pressures of 10 to 15 cm. H_2O with mixtures of air and oxygen. In general, this form of therapy should be reserved for the patient with chronic recurrent attacks who has some degree of complicating ventilatory insufficiency responsible for his disability. It is most useful in reeducation of diaphragmatic breathing and prevention of carbon dioxide retention. We have recently been able to demonstrate actual reduction in mechanical resistance and increase in pulmonary compliance, with resultant lowering of the work of breathing in these patients employing the Mark 7 unit.

In the presence of bronchial infection, bronchiectasis, or tenacious purulent secretions, the use of enzyme aerosols to attack the pus, such as pancreatic dornase (Dornavac), is indicated. It has proved to be efficacious in clearing bronchial infection of a chronic nature. Pancreatic dornase, dissolved in 0.5 or 1 cc. of the bronchodilator aerosol, is administered by aerosol in doses of 50,000 to 100,000 units, one to three times daily for five to seven days, with continuous aerosol technique or with intermittent positive pressure breathing. It is used in addition to, not instead of, antimicrobial therapy.

Therapeutic Gases.—Oxygen Therapy: If there is hypoxia and cyanosis, the patient should be given oxygen. His physical and personal requirements, as well as the concentration of oxygen desired, should be considered in selecting the type of equipment to be used. Unfortunately, most patients in status asthmaticus tolerate poorly the tight-fitting rubber face masks which are necessary when concentrations of oxygen above 60% are indicated. The simple Eliot plastic face tent supplies average concentrations of 50% oxygen in the inspired air, with oxygen flow rates of six liters per minute. The patients do not complain of claustrophobia or a sense of suffocation.

In general, there has been an overemphasis on the danger of inducing the carbon dioxide intoxication syndrome and respiratory acidosis by the sudden administration of high concentrations of oxygen in patients with classic intractable bronchial asthma. This danger, however, is always present in patients with chronic hypoxia secondary to chronic pulmonary emphysema or chronic pulmonary heart disease, particularly if respiratory depressing drugs are administered before, or along with, the high concentration of oxygen. In these patients the plastic nasal cannula-humidification technique is best employed. Initial low concentrations with flow rates of one liter per minute should be used. The flow rates may be cautiously increased by daily increments to six liters per minute, and subsequently the therapy may be maintained more simply and safely with the Eliot plastic face tent.

Helium-Oxygen Positive Pressure Breathing: If obstructive phenomena predominate, mixtures of 75% helium and 25% oxygen are more beneficial than oxygen alone. Subjective relief of dyspnea and wheezing may be observed frequently after positive pressure breathing of helium-oxygen mixtures. The gas mixture may be administered through the metered mask apparatus (made by the National Cylinder Gas Division of the Chemetron Corp. or by the Oxygen Equipment Manufacturing Corporation) which supplies an expiratory positive pressure when the exhaled air passes through constricted orifices. This method may be tiring, and the patient should be treated for periods of one-half to one hour four times daily. Rebreathing from the collecting bag may be permitted as an economy measure (helium saving). The intermittent positive pressure breathing unit may be employed; it is most efficacious and less tiring for the patient but more costly.

Bronchial Evacuation ("Catharsis").—The bronchitic cough is one of the most troublesome manifestations and may actually serve as the trigger mechanism for more extensive bronchiolar spasm. The therapeutic mechanisms for bronchial evacuation consist mainly in the use of (1) expectorants, (2) iodides, (3) ipecac, (4) positional drainage, and (5) bronchoscopy.

Expectorants: The expectorant drugs may prove quite helpful when properly used. A patient with an effective productive cough should not be over-sedated, or the mucus in

the bronchioles may become tenacious and inspissated, largely from dehydration and long retention. If the mucus is permitted to become impacted, the cough may become ineffective, and a state of "tussive insufficiency" will develop. One of the antihistamine preparations, a combination of diphenhydramine hydrochloride and aminophylline (Hydryllin) may be of value, particularly in patients with associated vasomotor rhinitis. Among the more ideal expectorants are the iodides, ipecac, and aerosols of water or detergents such as superinone (Alevaire) and Tergitol 08.

Iodides: Iodides are excellent bronchial evacuants. In the very sick patient, 1 to 2 Gm. of sodium iodide may be added to each liter of infusion fluid and administered for several days. When effective productive coughing occurs, the iodides may then be given orally again. Their action results in dilution and liquefaction of the retained secretions. Iodides are more efficacious when the patient is well hydrated. A disagreeable metallic, bitter taste is commonly experienced. The usual precautions in the use of iodides should be observed; namely, close watch for evidence of a variety of rashes and swelling, conjunctivitis, coryza, bronchorrhea, thyroiditis, and adenopathy. Administration should proceed cautiously. The initial dose should be 0.2 cc. of the saturated solution of potassium iodide after each meal and at bedtime. This may be increased by 0.1 cc. per dose each day until a maximum dose of 1.3 cc. is reached. The dose should then be abruptly reduced to 0.2 cc. and the same gradual increase of dosage repeated; this may prevent the development of intolerance. For patients in whom gastric irritation develops from a saturated solution of potassium iodide, enteric-coated tablets are available in 500 mg. and 1 Gm. sizes.

Ipecac: Ipecac acts by substituting effective retching in the place of ineffective coughing. Syrup of ipecac may be administered in doses of two or three teaspoonfuls followed by a cup of lukewarm boiled water. This dose may be repeated several days later, if indicated. It is always worth a trial before bronchoscopy is attempted.

Positional Drainage: Although of little benefit to those with useless cough, positional drainage may be of considerable value to the patient with accumulated secretions that are easily raised. The procedure is generally most efficacious in the management of associated bronchiectasis. It is more effective when carried out after bronchodilator therapy.

Bronchoscopy: One of the most common and important causes of death in asthma is obstruction of the larger and smaller air passages by inspissation of tenacious secretions. At times, spectacular improvement may follow bronchoscopic aspirations, even in a moribund patient. Because of the danger of serious reactions to the use of tetracaine hydrochloride or cocaine sprays and instillations for local anesthesia in asthmatic subjects, we generally prefer deep surgical anesthesia with ether. Intensive bronchoscopic aspiration is followed by marked subjective and objective improvement. It may prevent atelectatic complications, prove lifesaving, and be followed by a long period of remission.

Antitussive Measures.—The most effective antitussive measures center about the prevention of various trigger mechanisms responsible for the coughing paroxysms. Laughter, shouting, talking, crying, inhalation of tobacco smoke, dust, fumes, fogs, and smogs, sudden changes in temperature and humidity, and exertion are among the leading causes in precipitating troublesome coughing paroxysms, which frequently induce bronchospastic crises, expiratory ball valving, and actual alveolar disintegration. The patient should always be on the alert for these causes, and the sooner he learns his tolerance to these factors the more successful the "cure."

In a recent study in our laboratory we found that benzonatate (Tessalon) was a most helpful agent in the management of pharyngitis and tracheobronchitis. Administered as an aerosol or syrup sipped slowly, this preparation has a pleasing surface-anesthetic effect which, though short-lived, is free of the side-reactions observed with the "caine" preparations. When given orally (in the form of perles), there is suggestive evidence that the antitussive effect occurs by action at the pulmonary parenchymal proprioceptor centers. For more sustained effects in the patient with intractable coughing paroxysms during the daytime, intensive therapy with noscapine (Nectadon), 30 to 60 mg. given orally at graded intervals, has proved quite beneficial. We have not observed respiratory depression, significant drowsiness, or constipation with its repeated use. At bedtime, 15 to 30 mg. of dihydrocodeinone bitartrate has been most beneficial in suppressing the severe nocturnal coughing paroxysms.

Sedation.—Anxiety, fear, insecurity, restlessness, nervousness, insomnia, and mood and personality deviations are commonly encountered in patients with chronic recurrent attacks. These symptoms and a frank "alert state" may be accentuated by the very medications that these patients require, namely, aminophylline, adrenergic compounds, and the corticosteroids.

Heavy sedation should be avoided and only agents with a wide margin of safety used. Sodium bromide or chloral hydrate are helpful for the patient with mild, chronic recurrent attacks. When an attack has persisted for more than several hours, sedation should be given in addition to epinephrine and aminophylline given intravenously.

Meperidine hydrochloride, used in proper dosage, is a useful and safe drug in the treatment of the patient in an acute asthmatic attack or in status asthmaticus when the usual methods of treatment have failed or when fastness to epinephrine or aminophylline has developed. It has a far wider range of safety than morphine. The use of meperidine for a total of two to five days, administered at intervals of six to eight hours orally or parenterally in doses of 50 to 100 mg., has not caused addiction in our patients, even when this course was repeated at intervals of several weeks. However, we do not recommend its routine use in any of these patients. Meperidine can, of course, depress respiration if given in too large a dose or if repeated too frequently in patients with chronic bronchial asthma and associated emphysema.

If meperidine is contraindicated or not well tolerated, a retention enema of paraldehyde (20 to 30 cc.) or ether (60 to 70 cc.) may be administered at intervals of six or eight hours. These have proved of particular value in seriously ill asthmatic patients. Unfortunately, they are often irritating and difficult to retain.

Chlorpromazine (Thorazine), prochlorperazine (Compazine), and meprobamate (Equanil, Meprospan, Miltown) or similar "tranquilizers" may be of considerable clinical value in allaying the anxieties of seriously ill patients. In the hospitalized patient, 50 mg. of chlorpromazine hydrochloride may be administered intramuscularly upon admission and at eight-hour intervals for two to four days. Many patients with marked mood swings, anxiety, and compulsive behavior patterns receive considerable benefit from carefully selected, relatively nontoxic "tranquilizers" when administered over periods of many months. The pepped-up reactions and mood swings noted secondary to corticosteroid therapy have also been allayed in many patients with the simple addition of meprobamate plus prednisolone (Meprolone).

Management of Infections.—Evidence of respiratory tract infection is present in most patients with intractable bronchial asthma. Study of the sputum usually reveals polymorphonuclear leukocytes, bacteria, or pus in these patients. The leukocyte count, polymorphonuclear counts, and sedimentation rate may also be elevated. In general, the choice of the antimicrobial agent depends upon the predominating organisms, their drug susceptibility, and the patient's tolerance for the drug itself. Preceptive clinical judgment, tempered by practical bacteriological observations, is necessary in deciding what drugs or combination of drugs and dosages should be employed in an attempt to suppress to the total infection. Complete eradication occurs rarely.

Although the clinical activity of penicillin is entirely confined to infections caused by gram-positive micro-organisms, it is the most useful agent in these patients. Unfortunately, the high incidence of local or generalized allergic reactions to penicillin aerosol in these patients limits this technique,

which is otherwise most useful for the management of chronic bronchial infections. Penicillin is of particular value for hemolytic streptococci, since one does not usually encounter resistance. Unfortunately, an increasing number of strains of hemolytic staphylococci are penicillin-resistant. In these instances, erythromycin (Ilotycin), novobiocin (Albamycin, Cathomycin), kanamycin (Kantrex) sulfate, or chloramphenicol (Chloromycetin) should be administered. Because of the finding of mixed gram-positive and gram-negative organisms in most of our hospitalized patients seriously ill with intractable bronchial asthma and respiratory tract infections, we have administered combinations of 300,000 units of procaine penicillin G and 500 mg. of streptomycin sulfate every 12 hours. These combinations should be employed only for three to seven days because of the development of resistance to streptomycin in numerous instances. The incidence of severe reactions to penicillin given parenterally in patients with chronic bronchial asthma is higher than in the general hospital population, and a careful history of previous experiences with this drug should be elicited.

As an alternative or as a primary choice, one of the broad-spectrum antimicrobial agents—oxytetracycline (Terramycin), chlortetracycline (Aureomycin), tetracycline (Achromycin, Panmycin, Polycycline, Tetracyn), or chloramphenicol—may be used. In seriously ill patients, dosages of 250 mg., administered at six-hour intervals during the meal or with a glass of milk, may be employed for several days. The dosages should be tapered downward as soon as possible. Evidence of proctitis, Monilia invaders, granulocytopenia (with use of chloramphenicol), complicating Proteus vulgaris organisms, pseudomonas infections, and idiosyncrasy should always be looked for. The addition of nystatin (Mycostatin) when fungi appear in the sputum is advisable.

Confronted with the problem of an overwhelming bilateral pneumonia in a patient with intractable bronchial asthma which is not responsive to a host of antimicrobial agents, the physician is justified in adding corticotropin (Acth, Acthar, Corticotropin) or soluble hydrocortisone sodium succinate (Solu-Cortef).

Prophylactic antimicrobial therapy is of considerable value in debilitated patients with intractable bronchitis and asthma who are subject to recurrent respiratory tract infections during the winter months. In general, we employ orally one of the following antibiotics in the stated dosages: 500 mg. of sulfadiazine, 100,000 units of penicillin, or 100 mg. of tetracycline, given every 12 hours. These doses occasionally require slight revision.

It should always be kept in mind that to suppress or eradicate bronchial infection it is not sufficient to convert a purulent sputum to a mucoid one. The sputum must be adequately evacuated by employing the aforementioned principles of bronchial evacuation, with the use of positional drainage, expectorants, bronchodilator aerosols, pressure breathing therapy, and bronchoscopy.

An irreparable sinobronchitic syndrome often follows in the wake of chronic paranasal sinus disease. Free drainage of the paranasal sinuses and elimination of infection should be attempted. Allergy appears to be the dominant factor in most patients. The topical use of the "safer" vasoconstrictor drugs, such as phenylephrine hydrochloride in combination with an antihistaminic, corticosteroid, and antibiotic agent, is of considerable aid in maintaining nasal patency and limiting infection. With evidence of frank purulent infection, 100,000 units of potassium or sodium penicillin G may be added to 1 cc. of 1% phenylephrine hydrochloride and administered with the Eliot air pump unit employing nebulizer and nasal tips. Treatments can be given at intervals of four to six hours for days or weeks, as indicated and tolerated.

Remissive Measures.—The use of adrenal steroid therapy should represent but a single phase, albeit important, in the total therapeutic program. Although these hormones frequently have a striking ameliorative, anti-inflammatory, and antiallergic clinical effect (antiphlogistic), they seem only to arrest the disease and usually do not suppress it. They should be employed for restricted and considered use when all other conventional methods of therapy have proved ineffective in securing a remission. Unfortunately, in the management of the patient with chronic bronchial asthma, the physician pushing steroid therapy may find himself like the man holding the tiger's tail because of the problems attendant to withdrawal therapy.

Changes During and After Hormone Therapy: Accumulation of eight years' clinical experience and extensive laboratory studies with these hormones have resulted in recognition of the many side-effects and toxic reactions as well as an appreciation of the precautions and contraindications to be observed. The undesirable effects that may follow the clinical use of hormones may be classified generally into two groups, those caused by overdosage and those caused by withdrawal of the hormone. Since successful steroid therapy depends upon a state of hormone overdosage, it is unavoidable that effective hormone therapy will be associated with an exaggeration of the patient's normal physiological actions. Any of the symptoms and finally the fullblown picture of adrenocortical hyperfunction (Cushing's syndrome) may develop. In particular, diabetes mellitus, gastrointestinal hemorrhage, hypertension, osteoporosis, and growth arrest in children should be closely watched for.

Symptoms of hormone withdrawal are the result of a state of adrenal insufficiency created by hormonal suppression of adrenocortical function. The symptoms may be mild or severe, depending upon the dosages employed, duration of therapy, and rate of withdrawal of the hormone. This state of relative adrenal insufficiency may resemble the course of adrenal cortical hypofunction (Addison's disease). Any additional stress in the form of trauma, shock, surgery, or severe infection during this state of insufficiency may prove disastrous to the patient.

On decreasing the dose during withdrawal of the hormones, aches and pains, lassitude, and a wide spectrum of personality changes may occur. These symptoms usually clear up when the dose is increased but may recur when another attempt is made to decrease the dose. A delicate balance must be found with each patient.

The wide varieties of changes noted during and subsequent to steroid therapy are listed as follows. The less serious changes include facial mooning, acne, petechiae, purpura, edema, hirsutism, skin pigmentation, increased appetite, insomnia, headaches, aches, pains, weakness, lassitude, euphoria to mild depression, mental and physical hyperactivity, hypertension, tachycardia, glycosuria, hyperglycemia, aggravation of existing diabetes, depressed thyroid function, thrombophlebitis, and sensitivity reactions to corticotropin given intramuscularly, such as skin rashes, pruritus, urticaria, occasional wheezing, and angioneurotic edema. The more serious changes include potassium deficiency, muscular weakness, negative nitrogen balance, osteoporosis and fractures, especially in women after menopause and in immobilized patients, masked infections (bacterial, viral, and fungal), spread of existing infections, serious spread of nonpathogenic inhabitants of the gastrointestinal and respiratory tracts, mental confusion to severe psychotic manifestations, convulsions, exacerbation of quiescent ulcers, gastrointestinal hemorrhage and perforation, activation and spread of unsuspected or inactive tuberculosis, sensitivity reaction (anaphylactic shock), periarteritis, and postoperative adrenal insufficiency. The most serious or fatal changes include the withdrawal syndrome, "adrenocortical storm," poor tolerance to trauma, shock, and infections, and active atrophy of adrenal cortices.

Therapeutic Precautions: Among the therapeutic precautions to be followed are restriction of sodium chloride in the diet to 750 mg. daily, with corticotropin, cortisone (Cortisone, Cortogen, Cortone) acetate and hydrocortisone (Cortef, Cortil, Hycortole, Hydrocortone) therapy. The newer corticoid analogues do not usually require this strict restriction. The occasional use of chlorothiazide (Diuril) may be helpful when indicated by the presence of hypertension and/or the excessive weight gain from fluid and salt retention. Potas-

sium may be routinely administered in the form of a tableted mixture containing 500 mg. of ammonium chloride and 500 mg. of potassium chloride (Pot-Amide), 8 tablets daily. Supplemental potassium in the form of orange or cranberry juice (8 to 12 oz. daily) is preferred by many patients. The supplementary ammonium chloride in the Pot-Amide preparation acts as a mild diuretic agent and is followed by excretion of sodium and water. Potassium replacement is best carried out when the salt-retaining type of steroids is employed. This is of particular value in patients with moon-face, fluid and salt retention, and weight gain syndrome. In the presence of infection or suspected infection, the concomitant use of an antimicrobial is advisable. In general, the patient should receive a high-protein diet to offset the tendency toward negative nitrogen balance. For patients with a tendency toward gastric hyperacidity, it is advisable to prescribe antacids and belladonna alkaloids during hormone therapy. Periodic guaiac tests of finger specimens of stool are advisable in these patients and in others suspected of having gastrointestinal ulceration. When in doubt, a series of x-rays should be taken as a control measure. The use of androgens and/or estrogens is perhaps indicated when the patient receiving hormone therapy has evidence of osteoporosis, noted more usually in patients over 50 years of age who are on long-term therapy. Patients should receive adequate supplemental doses of corticosteroids in case of surgery, severe trauma, or other forms of major stress. To minimize adrenal suppression and atrophy in patients receiving long-term therapy with the corticoids, corticotropin gel may be administered periodically, and particularly when corticoid withdrawal is started.

Hormones.—Hormonal therapy should not be used until all of the other measures which may be indicated have been adequately employed. Finally, hormonal therapy is best employed in conjuction with the foregoing measures to secure a more effective and lasting remission, with the lowest possible dosage schedule and freedom from side-reactions. In patients with severe seasonal (pollen) asthma, short-term therapy should be administered when the patient has failed to respond within a week to intensive antihistaminic and bronchodilator therapy started at the very outset of symptoms.

Oral Route: The following corticosteroids have been used orally in order of their development: cortisone, hydrocortisone, prednisone (Deltasone, Delta, Meticorten), prednisolone (Delta Cortef, Hydeltra, Meticortelone), methylprednisolone (Medrol), triamcinolone (Aristocort, Kenacort), and more recently, dexamethasone (Decadron, Deronil). In general, it has been our custom to consistently employ lower initial therapeutic and maintenance dosages and to withdraw the drug with smaller reductions and over a longer period of time than reported by other investigators. This is possible when intensive supplemental, physiologically directed therapy is carried out simultaneously. It is our belief that fewer significant side-reactions will then be observed. Nevertheless, a continuous high index of suspicion of the hazards previously listed must be maintained at all times. This applies to all corticoid analogues, regardless of their purported safety features.

We have observed considerable variations in individual responses to the steroids. On occasion, a patient not responsive to prednisolone has shown dramatic improvement with cortisone or hydrocortisone. Similar observations may be noted with the newer prednisolone analogues triamcinolone and dexamethasone. The physician should be prepared to change preparations from time to time. The advantages of less profound alteration in potassium depletion and sodium retention, in the face of adequate anti-inflammatory properties, and the ability to select the agent best suited for the individual patient's appetite needs have given these newer corticoid analogues a more desirable status for general use than the parent compounds, cortisone and hydrocortisone.

During the seasonal (pollen) bouts of bronchial asthma, steroid therapy should be employed on a short-term basis only when the more conservative physiological measures have failed. Therapy over the shortest period of time commensurate with the patient's pollen season is usually adequate. The patient with tree, grass, and ragweed pollen asthma may not require therapy during the entire period from spring to Labor Day. Individual variations in sensitivity to different pollens may be elicited in careful history taking of previous years. The patient with ragweed pollen asthma is particularly grateful.

For the patient with chronic, intractable bronchial asthma, when vigorous therapy has failed, long-term steroid therapy becomes necessary. The physician does well to be "reluctantly forced into therapy" rather than to start it at once. He should not be motivated by the desire to show the patient, his family, and friends a brilliant therapeutic result by first starting steroid therapy.

During the past three years we have observed the effects of prednisolone in more than 400 adult patients with various types of chronic bronchial asthma and associated allergies. The dosage schedule most commonly followed was 5 mg. four times daily for the first three days, 5 mg. three times daily for four days, 5 mg. twice daily for seven days, and 5 mg. or less daily thereafter. Approximately 10% of the patients were able to remain on maintenance doses of 2.5 mg. Another 10% required slightly higher revisions initially and for maintenance. The majority of the patients were maintained on 5 mg. daily. During periods of unexplained stress or infections, the patients were permitted to return to their initial starting schedule, followed by the same gradual reduction. The reduction in dosage for withdrawal from long-term therapy is presently advised at 1 mg. per month. The drug may ultimately be spaced at intervals of two or three days during withdrawal. Preparation for surgical procedures is accomplished by returning to the full initial schedule two days before surgery. At times, supplemental hydrocortisone sodium succinate therapy given intravenously on the day of and after surgery is advisable.

With the use of prednisolone-meprobamate, we have not observed any over-all reduction in the basic dosage requirements. However, many patients with steroid-alert manifestations and patients during the pollen season appear to prefer this combination. It was considered best to maintain patients, with a past history of gastrointestinal bleeding, on buffered prednisolone (Co-Hydeltra). Supplemental antacid therapy is often advisable.

We recently reported on our observations in 44 patients with chronic bronchial asthma and allied disorders who were treated with triamcinolone. An additional 32 patients with chronic bronchial asthma have been studied since this report. There appeared to be a greater weight loss in this series than in the series who were given prednisolone. The over-all results were good; facial mooning and weight gain in some patients, but no serious sequelae, were observed. We have not observed any anorexia, weakness, or clinical evidence of excessive nitrogen or potassium loss in our patients with chronic bronchial asthma. The dosage requirements were on the order of 4 mg. of triamcinolone to 5 mg. of prednisolone (4:5). The schedules previously described for prednisolone were followed.

At the present time, we have under observation 52 patients with intractable bronchial asthma being treated with dexamethasone. This is an unusually interesting new steroid agent; more than one-half of the patients have noted tremendous increase in appetite and consistent weight gain. The weight gain has been influenced but little with supplemental chlorothiazide. However, there appears to be a great incidence of bleeding from the gastrointestinal tract thus far in our observations. Two patients developed bleeding; one had no history of peptic ulcer, whereas the other gave a history of duodenal ulcer. Dexamethasone appears better suited for the debilitated patient in whom weight gain is important. The dosage of this agent required for suppression of asthma is in the ratio of 1:3, as compared with that of triamcinolone.

Intravenous Route: The intravenous route is more efficacious for the hospitalized patient in serious status asthmaticus.

The patient is started on a continuous infusion of 5% dextrose injection, 30 drops per minute flow, thus ensuring approximately three liters per 24 hours. Aminophylline, 250 to 500 mg., is added to each liter, depending upon the patient's responses and tolerance. For the patient who has not received steroid therapy recently, 10 mg. of corticotropin is added to each liter, and a total dose of 30 mg. per 24 hours is given for one to three days. Those who have been on corticosteroids should receive hydrocortisone or hydrocortisone sodium succinate given intravenously. The quantitative eosinophils, which are consistently elevated at the outset, are usually low or absent by the second day of this program. With improvement in the patient, the corticotropin is administered only in the first liter of fluid daily for several more days. In the most severe cases, the infusion of dextrose and aminophylline is continued for an additional one or more days. With intravenous therapy the immediate results are generally more striking. However, the physiological hazards, particularly disturbances in psyche, potassium imbalance, and facial mooning, may be more pronounced.

Attempts should be made to maintain the remissive state with the use of aminophylline solution given rectally or oral preparations of aminophylline and bronchodilator sprays, given as needed. During treatment and after remission, many patients note that they can "do more with considerably less" of their therapeutic armamentarium.

Surgical Management

The proper management of the patient with chronic recurring bronchial asthma may tax the character and ingenuity of the physician. The therapeutic problem may be made even more difficult by the family and the disturbed emotional make-up of the patient. The physician should acquire a proper attitude of empathy rather than overt sympathy, and he should strive to firmly adjust the patient's personality to his disease. A mutuality of confidence must be established. Every severe asthmatic episode should be carefully considered apart from previous seizures. The "whims and cure-alls" of his patient and family should not be curtly dismissed but discussed rationally.

Unfortunately, too often, as with many chronic diseases, the hope of "surgical cures" is brought up. Benefit has been described after a wide variety of surgical procedures, and, indeed, specificity has been "suggested" for these measures. Notwithstanding the great technical skill of the modern thoracic surgical team, there appears but little enthusiasm for the operative procedures designed for the purpose of influencing the neurogenic control of the bronchioles and chemical secretions. Unfortunately, observations made in the laboratory on cats and dogs cannot be translated accurately into changes to be observed in humans with chronic bronchial asthma. Occasionally, brilliant temporary results have been reported after procedures attacking the sympathetic or parasympathetic (vagal) or both systems. These procedures have varied from the simpler procedures designed to block vagal influences, such as procaine injection to the vagal fibers in the mastoid region and procaine or alcohol block of the sympathetic stellate ganglions and the upper four thoracic ganglions, through a variety of unilateral and bilateral cervicothoracic sympatholytic or parasympatholytic designed resections. Finally, bilateral resection (two stages) of the posterior pulmonary plexus as well as resection of cervicothoracic sympathetic and complete pulmonary plexectomies have been performed. No unanimity of opinion as to the ideal surgical procedure for these hapless patients can be found. In fact, most of the early enthusiastic surgical investigators have stopped their search for surgical surcease. Many patients improve temporarily after these procedures. Long periods of rest in the hospital and intensive medical care may well explain this. The physiological and financial stress of major surgery, the attendant pain and discomfort, the complications of pneumothorax with ganglion surgery, trauma to bronchi and blood supply, with intrathoracic procedures and the discomfort of residual, unilateral, or bilateral Horner's syndrome and skin temperature changes noted after sympathetic surgery (the patient "looking and acting like a sad St. Bernard Dog") are quite disconcerting to say the least.

There is still another surgical procedure which has found some favor among thoracic surgeons. Beneficial results have been described in patients in whom excision of "trigger areas" of pulmonary destruction (bronchiectasis) or excision of areas of large emphysematous bullae was carried out. Excisional surgery, along with some type of interruption of the upper sympathetic or parasympathetic vagal chain below the level of the recurrent laryngeal nerve, is usually advocated by these surgeons. Definite bronchiectatic disease (saccular), which is unequivocally demonstrable (after maximal bronchodilation) by radiography and bronchography and which has served as a nidus for recurring pneumonitis, chronic suppurative disease, pulmonary hemorrhage, or progressive debility, should be dealt with as bronchiectasis per se and not as a possible "trigger mechanism" for chronic bronchial asthma. The indications for resectional surgery in these patients are clear-cut and uniformly accepted, and the curative results from the effects of the bronchiectasis are excellent. However, the course of the associated chronic bronchial asthma is usually not affected for long. The segmental bronchial areas, suggesting cylindrical bronchiectasis by radiography or bronchography, should not be resected unless the well-defined criteria referred to previously for resection of a proved saccular bronchiectatic area are present. After resection, lasting improvement should not be expected in the associated chronic brochial asthma.

Similar criteria should be applied to the patient with chronic bronchial asthma, secondary chronic pulmonary emphysema, and large bullae (seldom seen in this order of relationship). Demonstration of a progressive space-occupying lesion, which is encroaching on functioning lung, an expiratory check-value mechanism, and repeated bronchopulmonary infections with laboratory evidence of ventilatory insufficiency despite adequate therapy, is an indication for surgical intervention in patients with large bullae associated with chronic pulmonary emphysema and secondary bronchospastic crises. The choice of plication, excisional procedure, or another type of tailoring operation should be individualized.

The author has a dim view of the present status of the aforementioned thoracic surgical procedures for the cure or amelioration of chronic bronchial asthma. After surgery these patients generally continue to require long-term intensive medical therapy. Fortunately, physical rehabilitation and the use of adrenal steroid therapy, particularly with the newer corticoid analogues with potentially less mineralocorticoid reactions, intensive bronchodilation, and antibiotic therapy, have made their care more pleasant. Nevertheless, more adequate management of this large group of "pulmonary cripples" continues to remain a challenge to the family physician and the specialist. Unfortunately, these patients all too frequently require an "economic prescription."

The dexamethasone used in this study was supplied as Decadron by Dr. Elmer Alpert of Merck, Sharp & Dohme Research Laboratories, Division of Merck & Co., Inc., Rahway, N. J.

J.A.M.A.169:131/1063 (Mar. 7) 1959.

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in hospital pharmacy

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PHARMACIST—Male. Registered in La. and Mo. Experienced. Prefers Midwest. PW-161

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ASST. DIRECTOR OR DIRECTOR OF PHARMACY SERVICES—Male, single, B.S. Retail and 1 year hospital experience. Registered Ill. PW-119

How effective is Blanket Disinfection?

There's little doubt that the hospital blanket which is in such close contact with the patient offers a fertile field for spreading infection. Confirmation by bacteriologic tests usually reveals a surprisingly high count under ordinary blanket use situations.

Efforts to eliminate this reservoir for spreading staph (and other potentially dangerous organisms such as tubercle bacilli) have stimulated controlled studies in many hospitals... and the consequent adoption of routine disinfection of blankets between patients.

For example—

In New Hampshire, Adams' [1,2] *hospital added Amphyl® disinfectant to routine laundering of blankets as patients changed, or earlier if soiling occurred, with the result that "it renders them routinely sterile" and also "this disinfectant neither shrinks nor discolors blankets."*

In Washington, Ravenholt and others[3,4] *tested Amphyl for disinfecting hospital blankets heavily contaminated with staph. Their findings indicate that "the addition of a synthetic phenolic disinfectant Amphyl achieves virtual elimination of staphylococci on the blankets. Routine use of the tested disinfectant for washing blankets, pillows, and all laundry materials, as well as for surface disinfection, in a Seattle tuberculosis sanatorium for seven years has demonstrated that the disinfectant does not injure fabrics or other materials nor cause sensitivity reactions in personnel or patients. On the basis of these findings, the synthetic phenol used in these studies appears to be a suitable compound for use in blanket disinfection."*

Practical problems of laundry handling as well as the bactericidal and tuberculocidal effects of Amphyl have been considered in these reports. We hope you will find each article helpful in making Amphyl blanket disinfection routine in your own laundry. Also, Lehn & Fink's technical staff is always ready to assist you in strengthening control of cross infection in any area of your hospital. Just write us at 445 Park Avenue, New York 22, N. Y.

Professional Division
Lehn & Fink Products Corporation

We will be glad to send these reprints.

1. Adams, Ralph: Med. Times, 86:1119-1127 (Sept.) 1958.
2. Adams, Ralph: Resident Physician, 4:112-132 (Sept.) 1958.
3. Ravenholt, Otto H., and others: Hospitals, 32:75-80 (June 16) 1958.
4. Ravenholt, Otto H., and others: Med. Bull. U. of Minn. 29:421-429 (May 1) 1958.

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